AGENDA REPORT
City Council

MEETING DATE:	January 10, 2024		
PREPARED BY:	Abe Bandegan, P.E., T.E. City Traffic Engineer	**DEPARTMENT DIRECTOR:**	Jill Bankston, P.E. City Engineer
DEPARTMENT:	Engineering	**CITY MANAGER:**	Pamela Antil

SUBJECT:

Consideration of the Draft Encinitas Traffic Management Program (ETMP)

RECOMMENDED ACTION:

Approve the Draft Encinitas Traffic Management Program (Attachment 1), to replace the old Encinitas Neighborhood Management Program (ENTMP).

ENVIRONMENTAL CONSIDERATIONS:

This project is exempt from the California Environmental Quality Act (CEQA) because it is not a "project" under Section 15378(b)(5) of the CEQA Guidelines. The action being considered by the City Council is an administrative activity of government that will not result in the direct or indirect physical change in the environment.

The action being considered is related to the City's Climate Action Plan (CAP) and supports implementation of the following CAP City Actions: CET-1 Complete and Implement the Citywide Active Transportation Plan and CET-3 Improve Traffic Flow.

STRATEGIC PLAN:

The recommended action aligns with the Mobility & Alternate Modes vision of the Strategic Plan to provide safe transportation networks in the city to empower people to reach destinations by active transportation and micro-mobility. It also aligns with the Evolving and Preserving Community Character focus area of the Strategic Plan.

FISCAL CONSIDERATIONS:

There is no fiscal impact associated with the staff recommendation.

BACKGROUND:

The City of Encinitas Traffic Engineering Division manages two (2) programs that help manage neighborhood traffic flow and speed: 1) Encinitas Neighborhood Traffic Management Program (ENTMP) (Attachment 2) and 2) First Tier Speed Cushion Program (Attachment 3). Both programs allow the community and staff to work together to enhance safety and preserve community character in Encinitas neighborhoods.

The amendments to the Encinitas Neighborhood Traffic Management Program (ENTMP) were reviewed by the Mobility and Traffic Commission (MTSC) on August 11, 2003, and by City Council on April 27, 2005. In 2005, the City Council adopted Resolution No. 2005-21 establishing the first version of the ENTMP. The ENTMP implemented a process to evaluate safety and mobility in different neighborhoods of the City and to identify problems and potential solutions. A flowchart was created to clarify the evaluation process which involved the community in the decision-making process to the extent feasible.

The program was tested and implemented as a pilot and in the following years, traffic calming projects such as Rubenstein Avenue traffic management, were initiated and completed using the ENTMP process. However, the implementation process was relatively complicated and involved many steps that added to the timeframe.

Considering the relatively long and sometimes cost prohibitive implementation process of the ENTMP, the First Tier Speed Cushion Program was designed as a lower cost, more expedited process to address traffic calming requests. Eligible streets are considered for temporary speed feedback signs and speed cushions.

The First Tier Speed Cushion Program was reviewed by the MTSC on August 28, 2017, and City Council approved the program with minor modifications on November 15, 2017.

In 2021 and 2022, staff prepared several new policies regarding implementation of traffic management devices that were supported by the Mobility and Traffic Safety Commission including a Citywide sharrow policy, short term parking program, crosswalk implementation policy and a revision to the speed cushion program.

The Draft Encinitas Traffic Management Program (ETMP) will consolidate different traffic management policies of the City in a single document and simplify implementation. The Draft ETMP was presented to the Mobility and Traffic Safety Commission (MTSC) on June 12, 2023, and was supported by MTSC.

ANALYSIS:

Over the past few years, different policies have been drafted to clarify the implementation of traffic management tools in the ENTMP toolbox. These new policies were intended to simplify the process for residents, clarify the steps, and to explain the ENTMP toolbox and what measures can be implemented. Below is a summary of the proposed changes to the ENTMP that constitute the new ETMP:

1. The title of the program is changed to “Encinitas Traffic Management Program.”

2. The point system for evaluating projects is removed.

3. “Eligibility Criteria” are added:

    a. Roadways classified as local residential road or unclassified with a speed limit of 25 miles per hour (mph) are eligible for consideration for all ETMP traffic calming measures.

    b. On roadways with speed limits higher than 25 mph, the roadway should meet the residential or business activity district criteria of the California Vehicle Code to qualify for ETMP traffic calming.

    c. City Council can authorize implementation of ETMP traffic calming on classified roads with higher speed limits that don’t meet the above-mentioned criteria.

4. The first tier of the traffic management program is Education and Enforcement. Staff will initiate a 3-month program of education and enforcement. The roadway will be assessed after three (3) months to determine effectiveness and the need for more education and enforcement.

5. Speed Radar Feedback Signs, Rectangular Rapid Flashing Beacons (RRFB), and some signing and striping modifications is the second tier of the ETMP.

6. The Speed Cushion/Speed Table Program are incorporated into the second tier of the new ETMP.

7. Policies to implement measures such as Sharrows, stops signs, crosswalks, RRFBs, and Speed Radar Feedback Signs are incorporated into the second tier of the new ETMP program.

8. The third tier of the program is initiated if analyses show that speed is persisting six (6) to 12 months after implementation of the speed cushions/speed tables.

9. Implementation of the third tier of the ETMP requires designing and implementing traffic calming measures such as new or modified signing and striping, implementing new traffic calming measures from the ETMP toolbox and/or additional traffic control devices. These projects would need to be incorporated into the Department’s work plan and be approved and budgeted by City Council annually.

10. Traffic Management measures are categorized based on cost. Less costly measures are tier two measures, and more costly measures are tier three measures.

11. Success of third tier measures is evaluated by analyzing the speed 12 months after implementation. If the 85th percentile speed is six (6) mph or less from the posted speed limit, the program is considered successful.

ATTACHMENTS:

1. New Encinitas Traffic Management Program (ETMP)
2. 2005 Encinitas Neighborhood Traffic Management Program (ENTMP)
3. 2017 First Tier Speed Cushion Flowchart

THE CITY OF
ENCINITAS

Encinitas Traffic Management Program

JANUARY 2024

1.0 Introduction

The City of Encinitas prioritizes safety and mobility and works to create safe, pleasant residential streets that encourage Encinitas residents to walk and bicycle. With annual increases in traffic volume and bigger, faster vehicles, many neighborhoods have been affected by a lack of active transportation facilities. Residents have voiced their concerns and requested improved safety and mobility along various corridors of the city. These concerns prompted development of a comprehensive program with options for addressing traffic issues and a clearly defined the implementation process. This Encinitas Traffic Management Program (ETMP) handbook clarifies the process to implement safety and mobility measures on various roads of the City.

1.1 How to Use the Handbook

The handbook is divided into 5 sections.

Sections 1.0 and 2.0 provide an overview of the traffic management program.

Section 3.0 describes the process to initiate, design, and implement a traffic management plan. It includes a flow chart that visually illustrates the required steps.

Section 4.0, the ETMP Toolbox, explains different techniques that can be used alone or in combination with other tools to manage traffic.

Sections 5.0 includes details about different traffic management policies that are implemented through this program.

2.0 Encinitas Traffic Management: Program Overview

2.1 Program Purpose

The purpose of managing traffic flow and speed is to enhance safety and mobility and preserve community character in Encinitas neighborhoods. Many communities are voicing concerns about increasing traffic and increasing speeds. This expanded plan provides tools that can help manage or calm neighborhood traffic in residential areas.

Vehicle data shows that commute distances are getting longer, and the individual number of trips taken are increasing. A typical single-family home in the San Diego area generates 10 daily trips. This means that even residents in areas with little traffic from outside their neighborhood may notice a substantial amount of traffic each day.

In some neighborhoods, street pattern creates short-cuts that attract drivers who are trying to avoid congested areas. Some Encinitas residents have expressed concerns with cut-through traffic that creates excessive traffic volumes on their streets.

In addition to concerns about traffic volume, many residents are concerned about traffic speed. Most Encinitas residential streets are posted for maximum speeds of 25 mph.

Many factors influence a driver's selection of travel speed. For example, the width and length of a street affects the speed. The number of people visible, amount of landscaping, weather conditions, number of cars parked, and many other factors are quickly processed by a driver to select a comfortable speed. The driver's temperament, trip purpose, and time schedule are other considerations. Many drivers do not adhere to the posted speed limit.

2.2 Traffic Management Areas – Eligibility Criteria

The roadways that are eligible for implementation of the Encinitas Traffic Management Program shall be classified as a local, residential roads or be unclassified with a speed limit of 25 mph or lower per the most recent Mobility Element of the City's General Plan.

On classified roadways with speed limits higher than 25 mph, eligible roadways must meet the residence or business activity district criteria of the California Vehicle Code to qualify for the ETMP.

Per California Vehicle Code a Business Activity District has:

(A) A maximum of four traffic lanes.
(B) A maximum posted 30 miles per hour prima facie speed limit immediately prior to and after the business activity district, if establishing a 25 miles per hour speed limit.
(C) A maximum posted 25 miles per hour prima facie speed limit immediately prior to and after the business activity district, if establishing a 20 miles per hour speed limit.

Also:

… a "business activity district" is that portion of a highway and the property contiguous thereto that includes central or neighborhood downtowns, urban villages, or zoning designations that prioritize commercial land uses at the downtown or neighborhood scale and meets at least three of the following requirements in paragraphs (1) to (4), inclusive:
(1) No less than 50 percent of the contiguous property fronting the highway consists of retail or dining commercial uses, including outdoor dining, that open directly onto sidewalks adjacent to the highway.
(2) Parking, including parallel, diagonal, or perpendicular spaces located alongside the highway.
(3) Traffic control signals or stop signs regulating traffic flow on the highway, located at intervals of no more than 600 feet.
(4) Marked crosswalks not controlled by a traffic control device."

The California Vehicle Code description for a Residence District is provided below.

A "residence district" is that portion of a highway and the property contiguous thereto, other than a business district, (a) upon one side of which highway, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 13 or more separate dwelling

houses or business structures, or (b) upon both sides of which highway, collectively, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 16 or more separate dwelling houses or business structures. A residence district may be longer than one-quarter of a mile if the above ratio of separate dwelling houses or business structures to the length of the highway exists.

Under certain conditions, City Council can authorize implementation of ETMP on other classified roads with higher speed limits.

2.3 Process Overview

There are various safety and mobility enhancing measures that can be implemented on City streets. Traffic control devices often require enforcement to achieve maximum driver compliance. Education is used to encourage voluntary compliance, understanding of the devices, and an explanation of the community benefit.

The new program consists of three Tiers of Traffic Management:

- Tier I: Education and Enforcement
- Tier II: Small scale, cost effective measures such as speed radar feedback signs, speed limit signs, pavement legends, Rectangular Rapid Flashing Beacons, speed cushions and speed tables. Tier II also includes moderate-cost measures that can be implemented if there is available annual traffic engineering division budget or by incorporating the project into a future Traffic Work Plan.
- Tier III: Larger, more costly measures that need to be funded through the City's annual budget and the Capital Improvement Program annual work plan.

Specific policies have been created to help guide decisions in implementing various traffic management measures on city streets. These policies are included in Section 5.

3.0 Process

This section describes the process to develop and implement the traffic management program. Each step is described in detail below.

3.1 Traffic Management Request/Petition

The process to develop a traffic management plan for any neighborhood can be initiated by residents, staff, City Council, or by a vote of the Mobility and Traffic Safety Commission.

A resident initiated Traffic Management petition must be completed, signed by ten residents, and filed with the Engineering Department.

The request must provide preliminary information regarding the nature and location of the traffic concern. This provides staff with the information needed to conduct a field review to prepare for a preliminary neighborhood meeting.

3.2 Speed Data Collection

Speed Data is collected to determine the magnitude of the traffic concern in comparison to other neighborhoods requesting traffic management. Speeds are recorded to quantify how many drivers exceed the speed limit and what the overall speed profile is during different periods of day. After a project is completed, speed data can be compared to the before condition to measure success.

3.3 Three Tier Traffic Management

Based on the data collection and the 85th percentile speed, three different tiers of traffic management measures are available.

First Tier:
The 1st tier measures are applicable to any street with an 85th percentile speed that is 5 mph or more over the speed limit of the roadway. The first tier includes Education and Enforcement. Staff will initiate a 3-month program of education and enforcement with the help of Encinitas school districts (as needed) and San Diego County Sheriff's Department. Pamphlets and other educational material

will be distributed and targeted enforcement will be conducted. Neighborhood meetings will be scheduled as needed to provide information to the community.

The education component of the Traffic Management Program also features brochures and website information that explain the program, why it is needed, and the steps residents can take to implement the program in their neighborhood. Residents play a key role in distributing information about the program and in helping their neighbors understand the process.

Second Tier:
The 2nd tier measures are applicable to any street with an 85th percentile speed that is 7 mph or more over the speed limit of the roadway.

2nd tier measures include:

- Additional speed limit signs
- Additional speed limit pavement legends (per policy)
- Sharrow markings (per policy)
- Pedestrian crossing improvements such as upgrades to continental crosswalk or additional yield lines, Rectangular Rapid Flashing Beacons (RRFB) and advanced warning signage (per policy)
- Speed radar feedback signs (per policy)
- New Stop Signs (per policy)
- Speed Cushions/Speed Tables (per policy)

Policies to implement new 2nd tier measures such as Sharrows, stop signs, crosswalks, RRFBs, and Speed Radar Feedback Signs are provided in Section 5. Any proposed traffic calming measures need approval by the Fire Department to ensure it will not impact emergency response efforts.

Second tier measures may be implemented at the discretion of City Traffic Engineering Division based on character of the community, issue that needs to be resolved, geometry of the roadway and other specifications of the road and the neighborhood, using the traffic division's annual funding based on prioritization by staff. If the cost associated with the 2nd tier measures exceed available funding, projects can be added to future annual work plans for implementation in future years. Additional funding maybe requested from the City Council to implement 2nd tier measures.

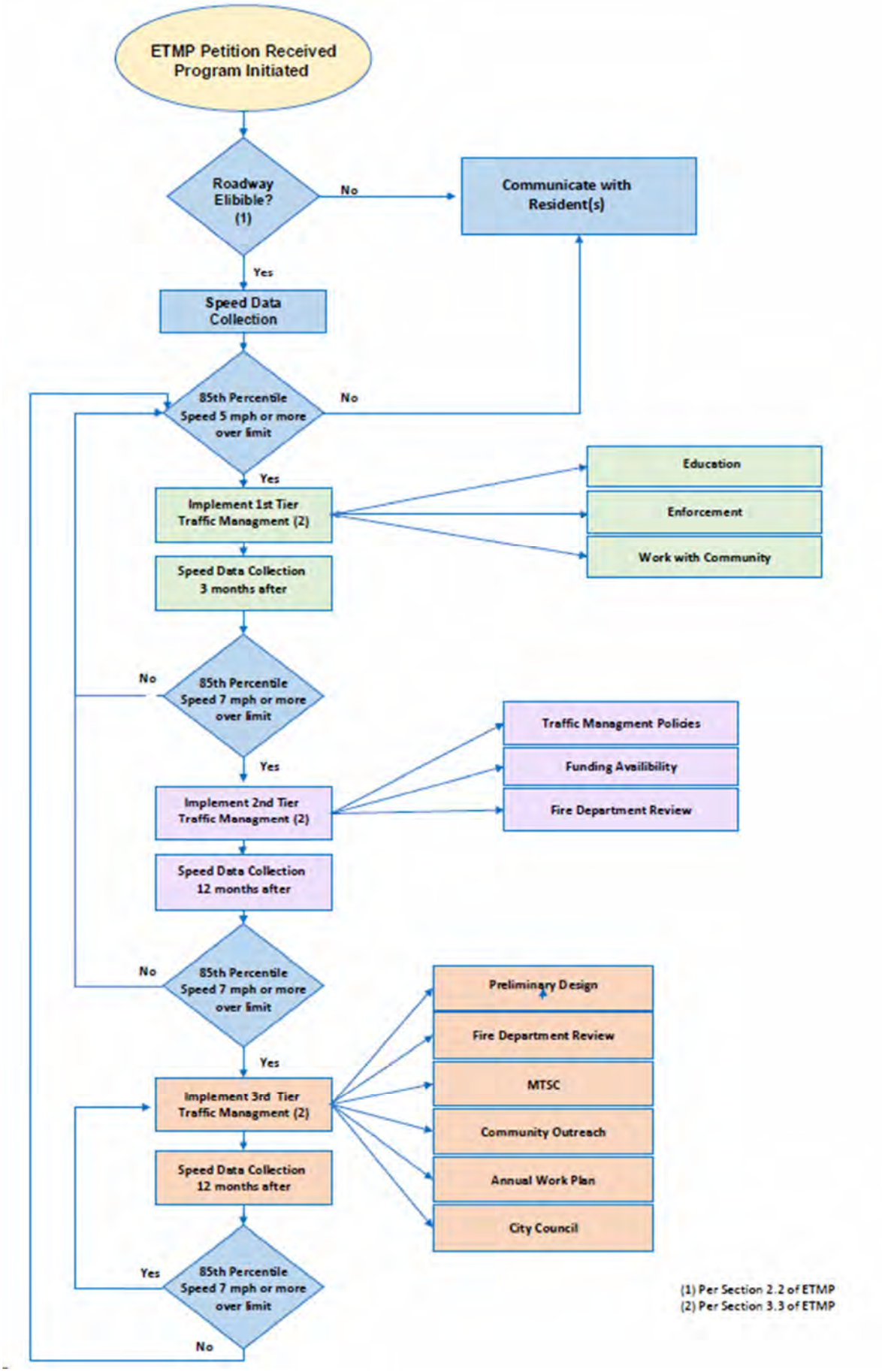
Third Tier:

The 3rd tier of the program can only be initiated if analyses prove that the speed issue is persisting 12 months after the implementation of the 2nd tier measures. If the 85th percentile speed remains 7 mph or more over the speed limit of the roadway 12 months after implementation of the 2nd tier measures, the 3rd tier would be initiated. All potential 3rd tier measures need to be approved by Fire Department before data collection and design is initiated for the program.

Implementation of the 3rd tier of the ETMP would require designing and implementing traffic management measures from the ETMP toolbox such as new/modified signing and striping and additional traffic control devices. Third Tier projects need to be incorporated into the City's CIP work plan and must be approved and budgeted by City Council.

Community meetings will be conducted to present findings and design alternatives, the Mobility and Traffic Safety Commission will provide input and feedback, and the final design requires approval by the City Council.

Success of the 3rd tier measures of the program is evaluated by analyzing the speed 12 months after implementing measures of the ETMP. If the 85th percentile speed is less than 7 mph from the posted speed limit, the program is considered successful.


ETMP Petition Received
Program Initiated
Roadway
Elibible?
(1)
No
Communicate with
Resident(s)
Yes
Speed Data
Collection
85th Percentile
Speed 5 mph or more
over limit
No
Yes
Implement 1st Tier
Traffic Managment (2)
Education
Enforcement
Work with Community
Speed Data Collection
3 months after
No
85th Percentile
Speed 7 mph or more
over limit
Yes
Implement 2nd Tier
Traffic Managment (2)
Traffic Managment Policies
Funding Availibility
Fire Department Review
Speed Data Collection
12 months after
No
85th Percentile
Speed 7 mph or more
over limit
Yes
Implement 3rd Tier
Traffic Managment (2)
Preliminary Design
Fire Department Review
MTSC
Community Outreach
Annual Work Plan
City Council
Speed Data Collection
12 months after
Yes
85th Percentile
Speed 7 mph or more
over limit
No
(1) Per Section 2.2 of ETMP
(2) Per Section 3.3 of ETMP

4.0 Traffic Management Toolbox

The Traffic Management Toolbox describes physical changes to the street environment intended to reduce negative effects of motor vehicle use, alter driver behavior, and improve safety and mobility. Each change is considered a traffic management measure. Most of the measures in the Toolbox are 3rd tier measures that will only be implemented if 1st tier and 2nd tier measures have been implemented but found not effective after 12 months.

Most measures achieve results by requiring drivers to go over or around a permanent feature placed in their travel path. This forced maneuver is referred to as deflection. Vertical deflection requires a driver to go over something, like a speed cushion, and horizontal deflection requires drivers to go around something, like a roundabout. Some measures create diversions that force drivers to alter their route. Some measures rely upon changing the driver's perception of the street. For example, narrowing the lanes with striping may change the perceived width of the street, prompting drivers to drive more slowly.

Appropriate locations, advantages, disadvantages, and cost ranges are provided in the toolbox. Selection of the right tools to calm a neighborhood requires careful evaluation of the impact the measure will have on residents, those providing services to residents, visitors, emergency vehicles, bicyclists, pedestrians, and those who are driving through the neighborhood.

Unless otherwise noted, all measures are expected to reduce vehicle speeds. Their exact impact on speeds will vary based on the measure, its design, street characteristics, number of vehicles parked on the street, landscaping and other visual elements within the driver's view, and the number of vehicles, bicyclists, and pedestrians using the street.

Some traffic management measures can be designed to include landscaping space, which adds visual appeal to the street and improves the visibility of the measure.

The Tier II and Tier III measures that follow are not in any specific order and will be chosen and implemented based on specific condition and character of the street that needs traffic calming.

Tier II: Narrow Street - Add Curbs, Walkways, Narrow Lanes

Streets without curb and gutter can create the appearance of a high-speed rural road that encourages some drivers to speed. Adding curb and gutter or sidewalks/walkways changes the appearance of the street to a local street and can prevent vehicles from encroaching on the unpaved shoulder area.

Street widths can have a significant impact on vehicle speeds. Reduction of travel lane width to ten feet also yields some reduction in speeds.

Location

- Local and collector streets

Advantages

- Can help lower speeds
- Channelizes drainage

Disadvantages

- High cost
- Lack of universal impact on drivers

Estimated Cost:
Curb and Gutter - $50 per linear foot

Example: South Vulcan Avenue Lane Narrowing

Before Lane Narrowing

After Lane Narrowing

Tier II: Add or Remove Center Lines

Marking centerlines that divide opposing travel lanes provides drivers with a clear indication of their travel width, location and path of on-coming vehicles. Adding a centerline on narrower roads where there is adjacent on-street parking or multiple driveways can cause increased friction and calm traffic by preventing vehicles from driving at the center of the roadway to maximize comfort which leads to speeding. Removing or not marking a centerline on roadways with less friction can sometimes create uncertainty and helps lower vehicle speeds. This measure may be combined with marking stripes along the edges of the street for parking or for bike lanes to yield a greater impact.

Location

- Local streets of any width

Advantages

- Low-cost technique
- Reduces maintenance costs

Disadvantages

- May not be effective on all drivers

Estimated Cost:

$5 per linear foot to remove centerlines and add white lines on street edges

Example: New Centerline on Olympus Street

Before Centerline Installation

After Centerline Installation

Tier II: Bike Lanes/Buffers

Bike lanes consist of two stripes that define the space on the street for riding bicycles. The minimum width for a bike lane adjacent to a parking lane or curb is five feet. If there are no curbs and gutters, the minimum width is four feet.

The stripe can narrow the travel lanes and give the overall street a more narrow appearance. They provide many other benefits to bicyclists and pedestrians, but because they do not deflect the vehicle travel path their impact on speeds may not be significant.

Location

- Collector Streets
- Streets with more than 1,500 ADT
- As designated in the Bikeway Master Plan

Advantages

- Provides separate riding space for bicyclists
- Narrows appearance of the street
- Provides lateral separation between pedestrians and traffic
- Provides a buffer area between those entering and exiting parking spaces and the moving traffic

Disadvantages

- Not effective on all drivers

Estimated Cost:

$10 per linear foot to remove center line and add white lines on two edges.

Example: Requeza Street Bike Lanes and Buffers

Before Bike Lanes and Buffers

After Bike Lanes and Buffers

Tier II: On-Street Parking

Vehicles parked on the street effectively reduce pavement width and can reduce vehicle speeds. Drivers are sometimes reluctant to park on the street because they fear their vehicle will be hit. Bulb-outs and tree wells along the street can protect parked vehicles while improving visibility between pedestrians and motorists.

Alternating on-street parking from one side of the street to the other on narrow streets creates a chicane-like effect.

Parallel or angled parking can be used alone or in combinations. This measure can be used in combination with landscaping to beautify the street and screen parking areas.

Marking of parking spaces is not necessary on collector roads or local streets unless the streets are wide and there is a need to narrow the street and encourage on street parking. On these streets a single line is all that is required.

Location

- All streets

Advantages

- Reduces street width
- Provides convenient access to abutting properties

Disadvantages

- May obscure pedestrians from drivers' view

Cost

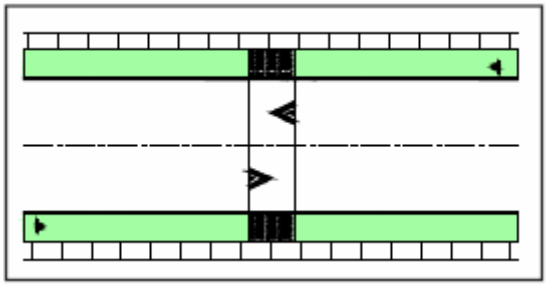
$5 per linear foot to add white lines on edges as needed

Example: Fortuna Ranch Road On-Street Parking

Before On-Street Parking

After On-Street Parking

Tier II: Speed Humps/Speed Cushions



Speed humps are asphalt or concrete street surfaces that span the width of the street and are raised and slightly rounded. When used in Encinitas, they are three (3) inches high and approximately 12 feet long. Speed humps create a driving surface that is uncomfortable at higher vehicle speeds, especially when used in closely spaced pairs. The discomfort prompts drivers to slow in advance of the hump. Speed humps have a minimal impact on vehicles with good suspension systems and a severe impact on large vehicles such as buses, garbage trucks and emergency vehicles. Speed humps will only be considered where there are no other viable alternatives or where impacts are restricted to the residents of that streets only, such as on a cul-de-sac.

Locations

- Local streets under 26 feet wide and not a primary EMS or bus route
- Streets with less than 3,000 ADT

Advantages

- Bicyclists do not have to move out of their travel path to cross

Disadvantages

- Emergency vehicles forced to almost stop at each hump
- Vehicles braking and accelerating create noise
- Can damage vehicles at higher speeds
- Limited affect on some vehicle types
- Potential Perceived impact to residential property values
- Uncomfortable for passengers of buses and ambulances
- Uncomfortable for people with back injuries or other chronic painful physical conditions [(3)]
- Restricts mobility for people using wheelchairs if installed where there are no sidewalks

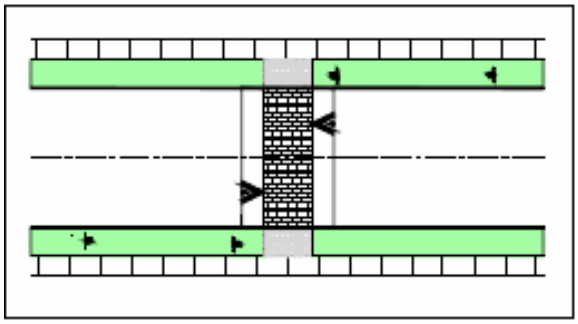
Estimated Cost:
$20,000 to $30,000

Example: Cornish Drive Speed Cushions

Before Speed Cushions

After Speed Cushions

Tier II: Speed Table



A speed table is an elevated, flat street surface with ramps on both sides to create a grade change on both sides of the table. A steeper grade on the approach and departure ramps will produce slower speeds. The sloped ramp leading to the platform is less jarring for vehicle occupants than a speed hump. A change in surface color and/or texture on top of the speed table can increase its effectiveness. Speed tables are effective tools for providing high visibility crosswalks schools, trails, and other mid-block crossing locations where slower speeds are desirable. They can be combined with bulb outs to shorten pedestrian crossing distances and prevent drivers from avoiding the full impact of the measure by driving with two tires in the gutter.

Locations

- Local and collector streets of any width not a primary EMS or bus route
- Streets with less than 5,000 ADT
- Marked, unsignalized mid-block pedestrian crossings

Advantages

- More easily traversed by large vehicles than speed humps
- Provides a defined pedestrian crossing area
- Improves visibility between pedestrians and drivers
- Raises vehicles to pedestrian level
- Eliminates need for a curb ramp at the crossing

Disadvantages

- Emergency vehicles forced to almost stop at the ramps
- Can damage vehicles at higher speeds
- Vehicles braking and accelerating create noise
- Can be uncomfortable for people with back and neck problems, though less jarring than speed humps (3)

Estimated Cost:
$20,000 to $40,000

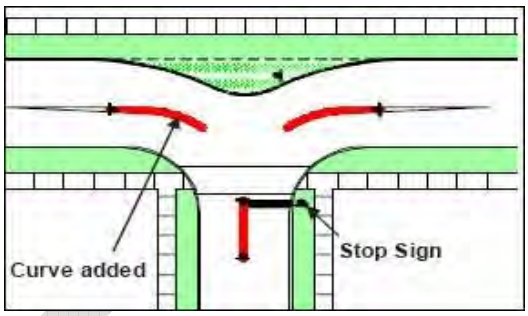
Example: North Coast Highway 101 Speed Table

Before Speed Table

After Speed Table

Tier II: Modified Tee Intersection

A curb extension added to the straight, through street at the top of a tee intersection modifies the travel path of through vehicles, forcing motorists to slow to negotiate the curve. The minor street, which terminates at the tee is controlled with a stop sign.



Locations

- Tee intersections
- Local and collector streets of any width

Advantages

- Eliminates high speed through movements.
- Can reduce through traffic on through leg of tee.

Disadvantages

- Large through vehicles may have some difficulty maneuvering around the median.

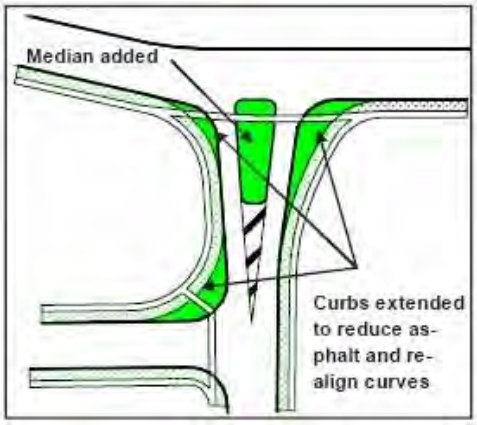
Estimated Cost:
$20,000 to $30,000

Modified Tee Intersection Example

Before Modified Tee

After Modified Tee

Tier II: Modified Intersection/Realignment



Intersections can be realigned in many different ways to tighten curves, reduce the amount of asphalt, or realign the streets. The sample in the illustration above and photo below demonstrate the reduction of asphalt to tighten the curves and create deflection to slow traffic.

Locations

- Local and collector streets of any width

Advantages

- Lower turning speeds
- Shorter pedestrian crossings
- Can discourage undesirable vehicle movements
- May provide enough additional green space to create a small park area

Disadvantages

- If not well designed, essential large vehicle movements may be restricted

Estimated Cost

It is not possible to provide a cost estimate for this type of design because the size of the intersection street widths, angles of intersect and other factors vary from site to site.

Example: Intersection Realignment at Sunset Drive and Orpheus Avenue

Before Intersection Realignment

After Intersection Realignment

Tier III: Short Medians

Raised medians of varying widths and lengths can reduce the width of overly wide streets. Medians can be designed to allow drivers full access to driveways.

Location

- Collector streets
- Streets over 26 feet wide

Advantages

- Eliminates turning conflicts in center turn lanes
- Eliminates use of center turn lane for passing
- Can provide pedestrians with refuge area
- Can be used to narrow travel lanes

Disadvantages

- Speeds may not be reduced because no deflection is created

Estimated Cost:
$20,000 to $50,000

Example: Short Median on Rubenstein Avenue

Before Short Median

After Short Median

Tier III: Mini Roundabout

Mini Roundabouts are circular intersections with channelized approaches. Entering traffic must yield to circulating traffic. Pedestrian crosswalks are marked one car-length from the entry and exit points. Roundabouts used in the traffic management program will be designed for a single lane of traffic on each leg. These mini roundabouts vary in size, depending upon the number, type and size of vehicles that will use them.

Encinitas roundabouts will be designed for traffic speeds between 15 and 20 mph.

Street grades can impact roundabout design. Techniques such as providing different grades on the high and low sides of the roundabout and different elevations on each side of the central island can be used to minimize the impact of street grades. Roundabouts vary in size depending upon street characteristics, traffic volume, and other factors.

Locations

- Streets over 26 feet wide
- Local, collector and arterial streets
- Intersections with 3 to 8 intersecting streets and adequate right-of-way
- At sites where a small roundabout would fit, but garbage trucks, school buses, or other large trucks must turn, four options can be considered:
    - Locate roundabout at intersection before or after the one where large vehicles have to turn
    - Reroute large vehicles to another intersection
    - Add a truck apron
    - Use a raised intersection table instead of a roundabout

Advantages

- Reduces number and severity of crashes compared to two-way and four-way stop control and traffic signals
- Simplifies intersections with more than three intersecting streets
- Reduces vehicle delay and queues
- Reduces pedestrian delay
- Shortens pedestrian crossings
- Reduces pedestrian/vehicle conflict points
- Allows pedestrians to cross one lane of traffic, wait in the refuge area for a gap in traffic, then proceed

- Increases likelihood of driver yielding to pedestrians
- Eliminates conflicts between pedestrians and motorists when walk and green signals are provided simultaneously
- Increases intersection capacity
- Reduces the greenhouse gas emissions associated with stopping and idling
- Signal power and maintenance costs are eliminated
- Useful life of a roundabout is approximately 2.5 greater than that of a signal system
- Eliminates driver confusion during power outages
- Slows vehicles, including emergency vehicles, without requiring them to stop unless other vehicles or pedestrians are present
- Emergency vehicles are not faced with through vehicles unexpectedly running the signal and hitting them at high speed. [2]

Disadvantages

- May require additional right-of-way
- May restrict some turns by larger vehicles
- Some visually impaired pedestrians who are not trained to use roundabouts may prefer signalized intersections
- Pedestrian walk routes are more circuitous than a standard intersection
- Some on-street parking spaces may be lost

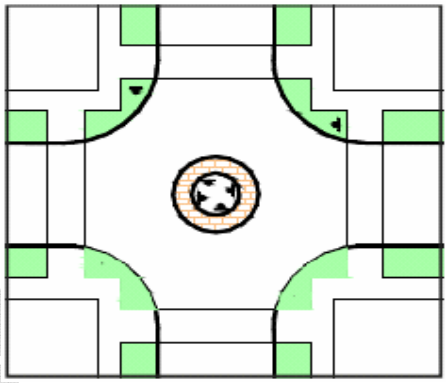
Estimated Cost:
$150,000 to $500,000

Mini Roundabout Example

Before Mini Roundabout

After Mini Roundabout

Tier III: Neighborhood Circle



Neighborhood circles consist of a raised island located in the center of an unsignalized intersection. Drivers maneuver around the central island rather than proceeding straight. Large vehicles are permitted to turn left in front of the circle. Seattle, Washington, reports intersection crash reductions of 93% following installation of these measures.

Traffic management circles can be converted to small roundabouts by adding painted or concrete splitter islands and roundabout signing and markings. Traffic management circles can replace two and four way stop controls on local streets.

Locations

- Local streets under 26 feet wide, with less than 5,000 vehicles per day
- Intersections with 4 streets that intersect at 90-degree angles

Advantages

- Reduced vehicle crashes compared to stop signs
- Slows vehicles, including emergency vehicles, without requiring them to stop unless other vehicles or pedestrians are present
- Landscaping reduces appearance of a long stretch of asphalt

Disadvantages

- Restricts larger vehicles
- Curb ramps may need to be relocated
- Wrong-way left turns could be problematic on busy residential or collector roads

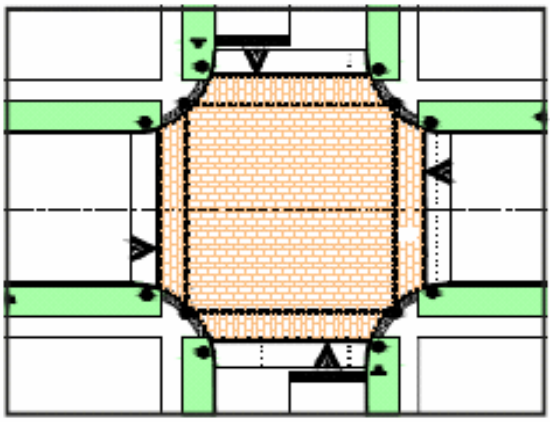
Estimated Cost:
$10,000 to $30,000

Example: Neighborhood Circle on Summit Avenue at Summit Place

Before Neighborhood Circle

After Neighborhood Circle

Tier III: Intersection Table



An intersection table elevates the entire intersection to sidewalk level. Ramps on all streets force drivers to slow as they enter and exit the intersection. The raised area is often brick or other textured material, which can enhance its management effect. If textured materials are used, a smooth corridor should be provided for people using wheelchairs and other personal assistance devices. One or more bollards are placed on each corner to prevent vehicles from cutting across corner space intended for use by pedestrians.

Locations

- Local and collector streets of any width with fewer than 7,500 vehicles per day and not on a primary EMS or bus route.
- Intersections of narrow streets where traffic management circle or roundabout would not fit
- Intersections where a roundabout or traffic circle would fit, but large vehicles could not make turns through the traffic circle/ roundabout

Advantages

- Places a visual emphasis on the intersection and pedestrians
- Minimizes loss of on-street parking, compared to a roundabout
- Allows large vehicles to make unrestricted turns, compared to a roundabout
- Can be easier to construct than a roundabout
- Can provide accessibility solutions for narrow sidewalks [3]

Disadvantages

- Increases turning difficulty because drivers must go up a ramp, turn, then go down a ramp
- Emergency vehicles must almost stop at every ramp

Estimated Cost:
$50,000 to $10,000

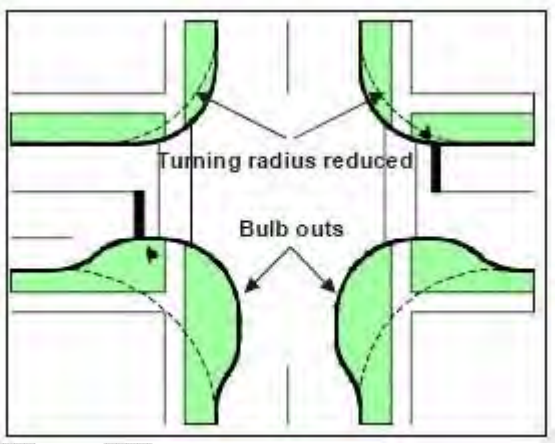
Intersection Table Example

Before Intersection Table

After Intersection Table

Tier III: Curb Extensions / Bulb Outs

Curb extensions, also referred to as bulb outs or bump outs, narrow the street by extending the curb into the parking lane, shoulder area, or curb lane. For purposes of this handbook, these measures will be referred to as bulb outs. Bulb outs do not extend into bike lanes. On-street parking impacts vary depending on existing practices and other site-specific conditions. Where there is no parking, the radius can be reduced.



Locations

- Wider streets with parking lanes, shoulder area, or overly wide curb lanes
- Downtown areas or near schools or other high-pedestrian activity areas

Advantages

- Shortens pedestrian crossings
- Pedestrians are more visible to drivers because they can enter the crosswalk at a point where parked vehicles do not block the driver's view
- Pedestrian can see approaching vehicles more easily
- When the curb radius is reduced by the bulb out, right turning vehicles are slowed
- Improves emergency access and side street visibility by eliminating illegal corner parking
- Provides space for curb ramps, street furniture, and landscaping
- Protects on-street parking areas
- Prevents vehicle travel in unused parking areas

Disadvantages

- Through vehicle speeds may not be substantially reduced unless other measures are combined with bulb outs
- Large Emergency vehicles may have difficulty navigating the turns

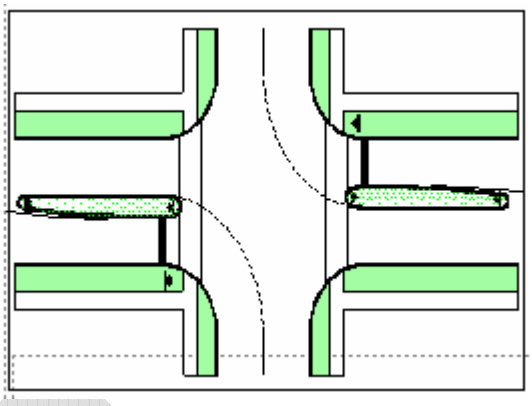
Estimated Cost:
$30,000 to $50,000 per corner

Example: Curb Extension on North Coast Highway 101 at North Court

Before Curb Extension

After Curb Extension

Tier III: Short Median at Intersection



Short medians between travel lanes at neighborhood intersections can slow turning vehicles and provide pedestrians with a refuge area. A median on each leg of an intersection prevents drivers from cutting across the intersection along a very large radius and forces drivers to make a slower, sharper turn around the median. In situations where a wide exit lane allows two vehicles to exit side-by-side, the median can narrow the street to a single narrow exit lane. This will discourage cut-through traffic by delaying drivers at the exit.

Locations

- Local and collector streets over 26' wide
- Intersections where drivers make high speed left turns into a neighborhood
- Especially useful if drivers are descending a hill before a left turn
- Useful to delay traffic exiting the neighborhood

Advantages

- Can serve as a neighborhood gateway
- Provides pedestrian with a refuge area

Disadvantages

- Can restrict large vehicle turns

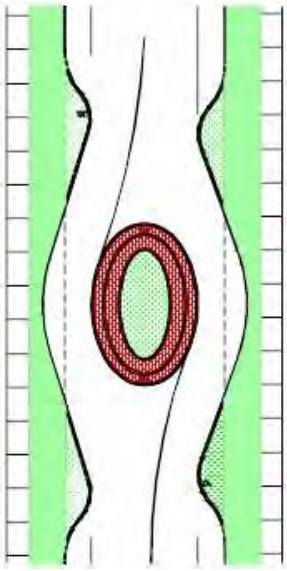
Estimated Cost:
$20,000 to $40,000

Example: Short Median at South Coast Highway 101 and G Street Intersection

Before Short Median at Intersection

After Short Median at Intersection

Tier III: Oval Median



A raised median in the shape of an oval is combined with a realigned curb to create a curve in the vehicle travel path. The center is often the site of a large tree or other highly visible feature.

A raised, oval-shaped median placed between narrow travel lanes forces drivers to slow to maneuver around the median. It may be necessary to extend curbs in advance of the median so driver cannot proceed straight through the curve. In such cases, the extension can become a location for trees or other landscaping features. The impact of the oval median, like other measures, is improved by provision of landscaping. The median can also provide an island for a pedestrian crossing.

Locations

- Local and collector streets over 26' wide

Advantages

- Can be designed to different speeds
- Can provide refuge for pedestrians and bicyclists crossing the street

Disadvantages

- Requires careful design to achieve real speed reduction
- Can restrict large vehicles

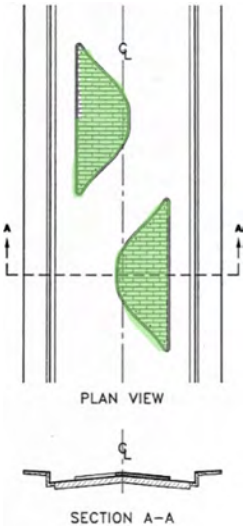
Estimated Cost:
$20,000 to $50,000

Example: Oval Median at Summit Avenue

Before Oval Median

After Oval Median

Tier III: Chicane



Chicanes are created using curb extensions that alternate from one side of the street to the other to create a single travel lane with S-shaped curves. Chicanes are sometimes referred to as deviations, serpentines, reversing curves, or twists. Chicanes rely on a curvilinear path and potential conflict between opposing traffic flows to reduce travel speeds. The design discourages drivers from cutting straight paths across the centerline or testing their skills on the curves or speed reductions will not occur.

Locations

- Local streets less than 26' wide and not a primary EMS or bus route
- Streets with less than 600 vehicles per day
- Two-lane, two-way streets
- One-lane, one-way streets

Advantages

- Potential for higher degree of speed reduction

Disadvantages

- It may be necessary to ban parking within the chicane

Most effective where trafficvolumes are balanced in each direction

- Trash may accumulate
- Bicyclists must merge with vehicles to pass through

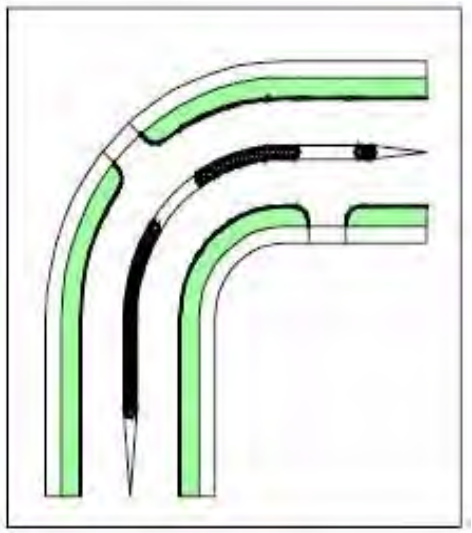
Estimated cost: $30,000 to $60,000

Chicane Example

Before Chicane

After Chicane

Tier III: Median on Curve



A raised median on a curve prevents vehicles from crossing the centerline. The opening in the median allows driveway access for adjacent homes.

Medians of various widths can be installed on curves to prevent vehicles from crossing the centerline to facilitate travel at higher speeds. Openings in the medians may be necessary to provide access to driveways. Raised pavement markers can be used on curves to create the effect of a median when site constraints or other factors, such as emergency vehicle access, prevent use of a raised curb.

Locations

- All streets over 26' wide

Advantages

- Stops drivers from crossing centerline on curves
- Prevents passing movements on curve
- Reduces travel lane width
- Can provide pedestrian refuge and shorten crossing distance

Disadvantages

- Can make travel around the curve by large vehicles difficult
- Can restrict access to some driveways unless
- openings are provided within the median at each driveway
- Trash may accumulate

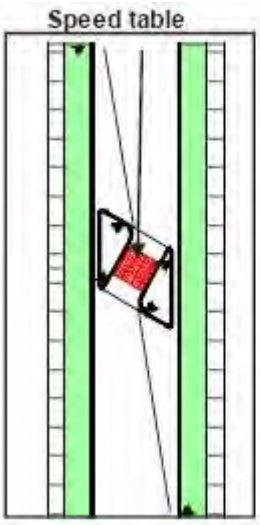
Estimated Cost:
$20,000 to $40,000

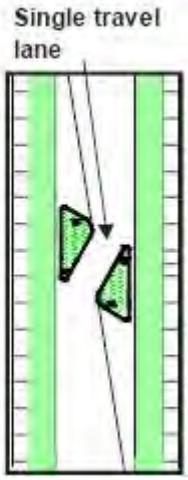
Example: Median on Curve on Rubenstein Avenue

Before Median on Curve

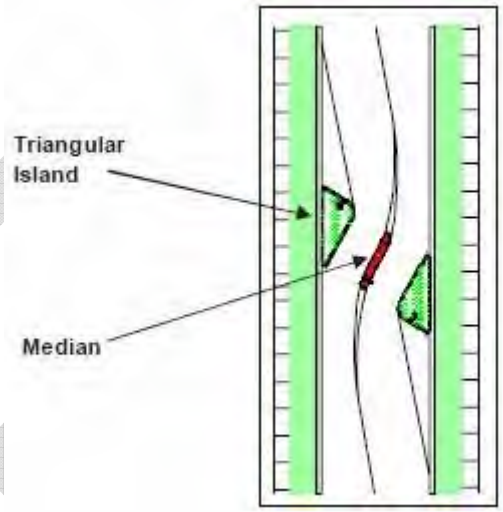
After Median on Curve

Tier III: Angled Slow Points





Triangular islands constructed on both sides of a street narrow the vehicle travel path a add a curve to a straight section on street. A short median can be installed between the travel lanes of two-lane slow points. Drivers must slow to negotiate the turns needed to maneuver through the curve created by the islands. On single-lane slow points drivers must yield to oncoming traffic. A raised median can be added to slow points for added deflection.



Locations

- Local and collector streets and not on a primary EMS or bus route
- Single lane slow points on streets with fewer than 3,000 vehicles daily

Advantages

- Create horizontal deflection while maintaining passage for large vehicles

Disadvantages

- Bicyclists must merge with vehicles to pass through
- Trash may accumulate

Estimated Cost:

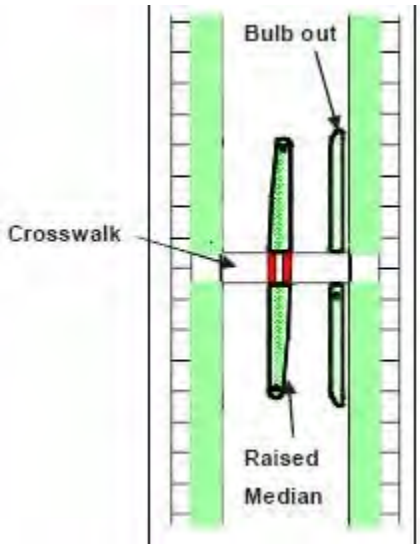
Two lanes - $20,000 to $50,000

Example: Summit Avenue Angled Slow Point

Before Angled Slow Point

After Angled Slow Point

Tier III: Raised Pedestrian Refuge



Pedestrian islands are short medians placed in the center of the roadway separating opposing lanes of traffic. The island allows pedestrians to cross one-half of the street, wait outside the traveled way until vehicular traffic yields or there is a gap in traffic that allows them to complete their crossing. Wait and crossing times are decreased. Trees will small trunks should be planted in the refuge on both sides of the crosswalk to increase visibility of the measure.

Other measures such as bulb outs, narrow travel lanes and others can be combined with the island to achieve desired speeds and improve motorist yield behavior.

Locations

- Local and collector streets over 26' wide

Advantages

- Provides pedestrians with safer, more convenient crossings
- Breaks up the continuous nature of the street

Disadvantages

- Must be combined with other measures to create deflection

Estimated Cost:
$20,000 to $50,000

Example: Raised Pedestrian Refuge on South Coast Highway 101 at G Street

Before Raised Pedestrian Refuge

After Raised Pedestrian Refuge

5.0 Traffic Management Policies

This section includes details regarding implementation of various traffic management policies that are implemented using the ETMP. Implementing each of the following measures, staff follows the policies and criteria established for implementation of the measures to create consistency and minimize confusion and maximize efficiency. The following policies can be found in the appendix.

5.1 Speed Cushion/Speed Table Program

5.2 Streetlight Guidelines

5.3 Flashing Stop Signs

5.4 Sharrows

5.5 Marked Crosswalks

5.6 Speed Legends

5.7 Speed Feedback Signs

Appendix

5.1 Speed Cushion/Speed Table Program

BACKGROUND

Speed cushions are a vertical deflection traffic calming device that includes wheel cutouts to allow large vehicles such as emergency vehicles to pass unaffected, while reducing vehicular speeds. They can be offset to allow unimpeded passage by emergency vehicles and are typically used on key emergency response routes. Speed cushions extend across one direction of travel with a longitudinal gap to allow wide-wheeled vehicles to avoid going over the hump.

Speed cushions were approved for use by City Council in 2010 with support of the Fire Chief and Fire Marshal. The Fire Department indicated a preference for speed cushions over speed humps based on feedback received from Fire Engineers that are familiar with driving apparatus over both types of devices in the City. It should be noted that speed cushions/humps are the most commonly requested traffic calming treatment in the City.

POLICY

The speed cushion policy is described in detail below and can also be viewed in a flowchart format (see Attachment 1).

1. Residents of the interested street must complete a petition signed by the residents of a minimum of 10 different addresses on the street. A blank form petition was developed and is placed on the city website Traffic Engineering page.

2. Upon receipt of a completed petition, the City will evaluate whether the street qualifies as a “Residence District” per California Vehicles Code (CVC) 515 (or the most recent relevant code) or Section 2B.13 of the Manual on Uniform Traffic Control Devices (MUTCD) (or the most recent relevant section).

   From CVC 515:
   “ A “residence district” is that portion of a highway and the property contiguous thereto, other than a business district, (a) upon one side of which highway, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 13 or more separate dwelling houses or business structures, or (b) upon both sides of which highway, collectively, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 16 or more separate dwelling houses or business structures. A residence district may be longer than one-quarter of a mile if the above ratio of separate dwelling houses or business structures to the length of the highway exists.”

   From CA-MUTCD 2014:
   “… 29 When qualifying an appropriate speed limit, local authorities may also consider all of the following findings:

A. Residential density, if any of the following conditions exist on the particular portion of highway and the property contiguous thereto, other than a business district:

   i. Upon one side of the highway, within 0.25 miles, the contiguous property fronting thereon is occupied by 13 or more separate dwelling houses or business structures.
   ii. Upon both sides of the highway, collectively, within a distance of 0.25 miles the contiguous property fronting thereon is occupied by 16 or more separate dwelling houses or business structures.
   iii. The portion of highway is larger than 0.25 miles but has the ratio of separate dwelling houses or business structures to the length of the highway described in either subparagraph 1 or 2 above."

3. If street qualifies as a Residence District, staff will request feedback from Fire Department. (See "Additional Policy" notes below)

4. The City will collect data and evaluate the subject street based on the following criteria. In order for the street to qualify, it needs to meet 3 criteria (if criteria 2 is met) or 4 criteria (if criteria 2 is not met) out of 5 of the following conditions:

   a. The roadway has an Average Daily Traffic (ADT) of 500 vehicles or more.
   b. 85th percentile speed of the roadway segment is 7 mph or more above the speed limit of the roadway.
   c. The roadway has a substandard geometry such as vertical or horizontal misalignments which can cause safety concerns.
   d. The roadway is within proximity of a major public pedestrian generator (school, park, library …)
   e. The roadway does not have active transportation facilities (sidewalks, bike lanes, and other non-vehicular facilities)

5. When multiple requests are received, the City will proceed with the highest priority streets first (based on staff's evaluation of speeding situation and safety). The number of evaluations to move forward is based on budget constraints as well as feedback from the Fire Department.

6. When a street has been funded, staff will work with neighbors on the street (typically a small group consisting of the petition submitter and the neighbors that signed the petition or a sub-group thereof) to determine the appropriate location of speed cushions based on spacing criteria, roadway curvature, etc.

7. Once the small group agrees with the proposed speed cushion locations, the City will mail an advisory vote to the "impacted" property owners of the subject street. The advisory vote will show the proposed speed cushion locations and ask whether the owner:

- wants speed cushions,
- agrees with the proposed locations.

A minimum return percentage rate of 50% will be required for an advisory vote to be considered responsive.

"Impacted" property owners/residents that will receive a voting ballot include:

a. Residents living on the subject street within 500' of the potential speed cushion/table location(s); OR
b. Residents living on the subject street (or cul-de-sac off subject street) with no other outlet roads intersecting the roadway and would need to pass the location of the potential speed cushions/tables for their commute.

8. If the minimum return rate is not satisfied, this will be interpreted as a lack of interest and the speed cushions will not be installed.

9. If the minimum return rate is satisfied and a minimum of 1/2 of the returned advisory votes do NOT indicate support of speed cushions, this will be interpreted as a lack of interest and the speed cushions will not be installed.

10. If the minimum return rate is satisfied and a minimum of 1/2 of the returned advisory votes indicate a yes vote for the speed cushions, but a minimum of 1/2 do NOT agree with the proposed locations, then the speed cushions will not be installed as shown in the advisory vote.
    a. The City will again work with the small group to determine appropriate speed cushion locations. The updated proposed locations will again be put to an advisory vote. If it does not pass on the second attempt, this will be interpreted as a lack of interest and the speed cushions will not be installed. The street will be eligible to have temporary speed feedback signage installed.

11. If the minimum return rate is satisfied and a minimum of 1/2 of the returned advisory votes indicate a yes vote for the speed cushions and a minimum of 1/2 agree with the proposed locations, then the speed cushions will be scheduled for installation, as funding allows.

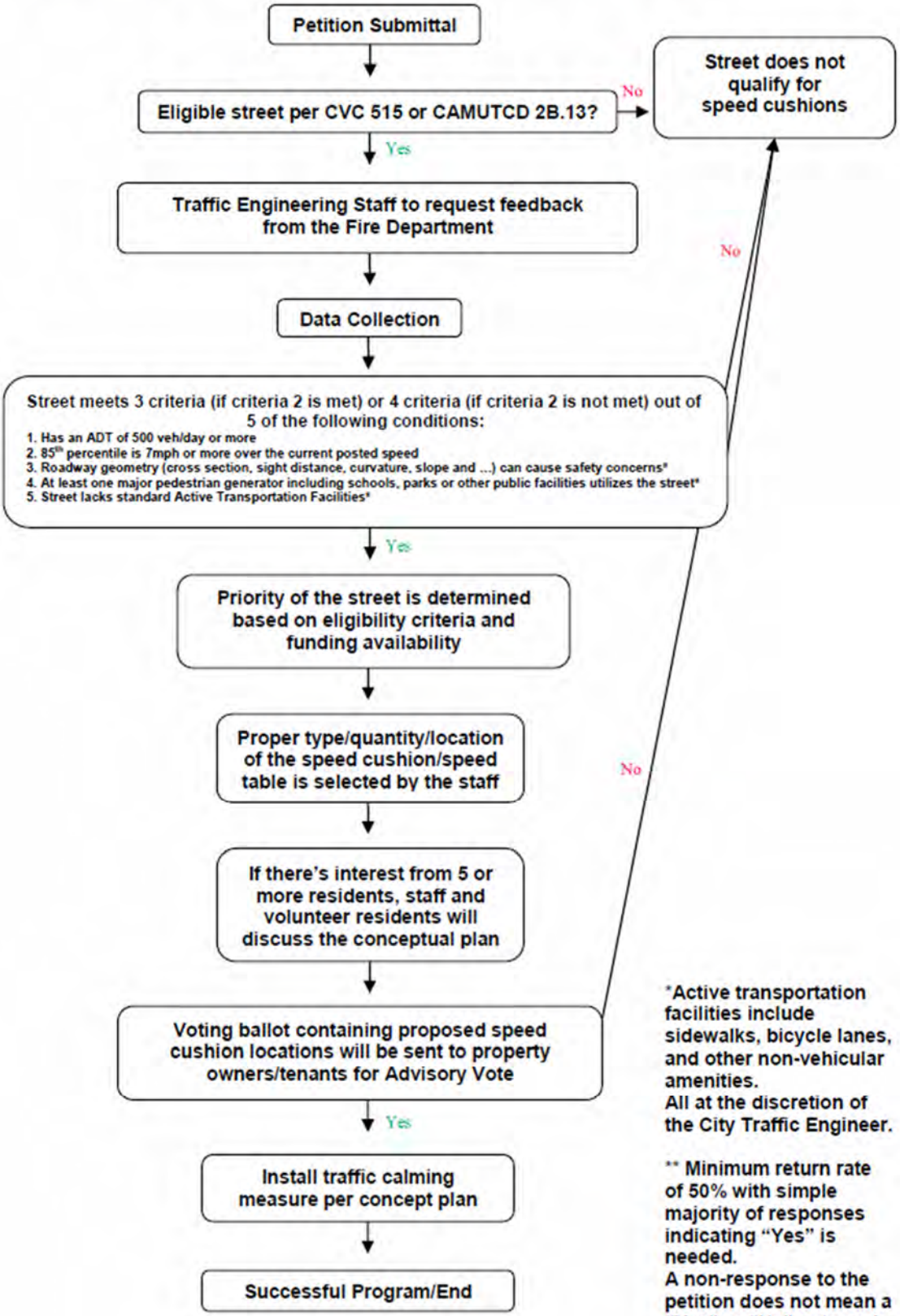
12. Staff will collect data on the subject street 6-12 months after the installation of the speed cushions/tables to measure the effectiveness of the traffic calming devices.

Additional Policy Notes:

A. Speed cushions shall be removed if their installation negatively affects emergency response.
B. Traffic calming will not be approved in areas within the 'Very High Fire Hazard Severity Zone' (Attachment 2).

C. Residents can request their street be re-evaluated for speed cushions no sooner than one (1) year after initial speed cushion evaluation was denied.

Speed Cushion Policy Flowchart



*Active transportation facilities include sidewalks, bicycle lanes, and other non-vehicular amenities.
All at the discretion of the City Traffic Engineer.

** Minimum return rate of 50% with simple majority of responses indicating "Yes" is needed.
A non-response to the petition does not mean a "Yes" or "No" vote and will not be counted as part of the process.

5.2 Streetlight Guidelines

The main purpose of roadway lighting is to provide better safety, security, and commerce through increased visibility of all public streets at night. The following lighting guidelines are designed with safety and security in mind while considering sustainability, light pollution, cost, and maintenance.

General

- These lighting guidelines apply to public streets and is intended for all new development and re-development projects within the City of Encinitas.
- Lighting for existing public facilities, such as parking lots, does not necessarily follow this document and is up to the City's discretion for lighting maintenance.
- The luminaire types identified in this document will apply for lighting retrofits based upon the facilities they serve.
- The focus of this document is on requirements for continuous lighting within the City of Encinitas. The City will have the final decision on the lighting levels required based on the street classification, pedestrian use, and any special circumstances for the area of concern.
- Street light poles should be pre-stressed concrete with an exposed concrete aggregate finish and a graffiti-resistant coating unless otherwise approved by the City (Director of Public Works).
- Street light poles should have a height of 28 feet (± 2 feet to match existing nearby lighting) with an aluminum or galvanized steel mast arm of 8 feet (± 2 feet) in length unless otherwise approved by the City (Director of Public Works).
- Street lighting conduit and pull boxes shall be in conformance with the latest version of the Greenbook Standard Specifications for Public Works Construction unless otherwise approved by the City (Director of Public Works).
- The use of landscape feature lighting within the public right-of-way is encouraged for aesthetic purposes.
- Landscape up-lights within the public right-of-way are effective for accentuating trees and other plant material; however, they should not be used as the sole source of illumination along walkways or other pedestrian areas.
- All site, landscape or building exterior lighting shall be of a configuration, style, finish and color that complements the architectural theme and materials established by the building architecture, subject to final approval by the City. Patterns of light and fixture concealment should be designed to avoid glare and intrusion into adjacent properties.

Luminaire Guidelines

- In this standard, luminaire is defined as the light fixture whereas street lights or lighting is defined as the entire light standard (pole, foundation, and fixture).
- Luminaires should be LED and cobra-head form for street and roadway lighting unless otherwise noted.

- Decorative street lighting fixtures should have the same lighting characteristics as defined in this section for the appropriate street classification.
- All lighting should be broad spectrum light sources with a Correlated Color Temperature (CCT) no greater than 4000K.
- All lighting should be full cut-off and utilize shielding when necessary to reduce spillover to adjacent properties.
- Luminaires shall have an ANSI C136.41 compliant NEMA 7 pin receptacle for use with photo controls and compatibility with future smart lighting applications.
- Continuous pedestrian scale lighting should be installed in high pedestrian areas along the sidewalk or walkway.
- Energy code regulations for exterior lighting are in the current version of California's Title 24 regulations.
- Pedestrian scale light poles should have a height of 15 feet (± 2 feet) and utilize an acorn style post-top mounted luminaire.
- Pedestrian scale light spacing shall be a maximum of 50' on-center in the walkway area.
- The following luminaire types referenced in this document are defined as follows in the Table below

Luminaire Requirements		
Luminaire Type	**Required Lumen Output**	**Light Distribution**
Safety Luminaire (Light)	14,250 lumens, minimum	Type IV
Arterial Luminaire (Light)	14,250 lumens, minimum	Type III
Local Luminaire (Light)	5,750 lumens, minimum	Type II
Pedestrian Scale Light	3,890 lumens, minimum	Type V

Roadway Lighting

Roadway lighting shall be installed to conform with the following table

Table Continuous Roadway Lighting			
Street Classification	**Pedestrian Activity Classification**		
	Low (Residential)	**Medium**	**High (Commercial)**
Prime Arterial (80'-110')	Arterial Light 160' Spacing[3]	Arterial Light 135' Spacing[3]	Arterial Light 100' Spacing[3]

Major Arterial (64'-80')	Arterial Light 325' Spacing[3]	Arterial Light 220' Spacing[3]	Arterial Light 155' Spacing[3]
Collector (40'-64')	Arterial Light 450' Spacing[3]	Arterial Light 350' Spacing[3]	Arterial Light 245' Spacing[3]
Local (Up to 40')	Local Light 400' Spacing[3]	Local Light 225' Spacing[3]	Local Light 200' Spacing[3]

Notes:
1. Roadway cross-sections are measured curb-to-curb and are approximate and may vary along roadway segments.
2. Street classifications are per the current City of Encinitas General Plan, Circulation Element.
3. Lights are to be placed in a staggered configuration and the spacing refers to the distance between lights on the same side of the roadway. Spacing distance has a tolerance of ± 25 feet.
4. Urban core areas with high pedestrian volumes (e.g. portions of South Coast Highway 101) will utilize pedestrian scale lighting. The use of pedestrian scale lighting as noted in Section 6.2 is up to the City's discretion.
5. Pedestrian activity level will ultimately be a judgement made by the City. The following is guidance provided from IES RP-8-18:

- Low – the lighting system in residential areas can allow both driver and pedestrian to visually orient in the environment, detect obstacles, identify other pedestrians, read street signs, and recognize landmarks.
- Medium – areas have moderate pedestrian activity, typically those near to community facilities such as libraries and recreation centers. Safety for the pedestrian and providing guidance to primary travel ways are key elements for the lighting system in these areas.
- High – commercial areas in urban environments where the visual environment is much more cluttered. It is important to provide lighting systems that will increase the visibility of pedestrians.

Intersection Safety Lighting

Lighting shall be installed at all street intersections adjacent to continuous street lighting per table blow.

Table 1-3: Intersection Safety Lighting

Street Classification	Prime Arterial (80'-110')	Major Arterial (64'-80')	Collector (40'-64')	Local (Up to 40')
Major and Prime Arterial (64'-110')	Install (4) Arterial Lights	Install (4) Arterial Lights	Install (4) Arterial Lights	Install (4) Arterial Lights
Collector (40'-64')	Install (2) Arterial, (2) Arterial Lights	Install (2) Arterial, (2) Arterial Lights	Install (4) Arterial Lights	Install (2) Arterial, (2) Local Lights
Local (Up to 40')	Install (2) Arterial, (2) Local Lights	Install (2) Arterial, (2) Local Lights	Install (2) Arterial, (2) Local Lights	Install (4) Local Lights[5]

Notes:
1. Roadway cross-sections are measured curb-to-curb and are approximate and may vary along roadway segments.
2. Street classifications are per the current City of Encinitas General Plan, Circulation Element.
3. All signalized intersections shall have at least one intersection safety light on each corner.
4. For intersections where four lights are installed, they shall be installed on the far-right corners of the approach lane(s) of the appropriate street classification.
5. For isolated local/local intersections without advanced continuous lighting, install (2) local lights for partial lighting. The lights shall be installed on the far-right corners of the approach lane(s) of the major street.

Roundabout Lighting

- Roundabouts and traffic circles should require continuous lighting throughout the facility.
- Due to the unique nature of roundabouts and traffic circles, the City of Encinitas requires a photometric analysis (performed by a consultant) to determine the number and location of lights.
- The luminaire type should match the luminaire guidelines from Section 6.2 based on the facility classifications.
- Lighting for roundabouts should focus on the approach and the perimeter and not from within the center island of the roundabout.
- The photometric analysis should utilize a combination of horizontal illuminance for the roadway and vertical illuminance in the crosswalks (if present).
- Further design guidelines can be found in the current version of ANSI/IES RP-8 publication (or the most recent relevant ANSI publication) titled Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting and FHWA's Roundabouts: An Informational Guide.
- Table 6-4 represents the required illuminance values for roundabouts:

Table 1-4: Illuminance for Roundabouts (fc)

Functional Classification	Pedestrian Activity Classification			E_{avg}/E_{min}
	High	Medium	Low	
Prime & Major/Prime & Major	3.2	2.4	1.7	3:1
Prime & Major/Collector	2.7	2.0	1.4	3:1
Prime & Major/Local	2.4	1.9	1.2	3:1
Collector/Collector	2.2	1.7	1.1	4:1
Collector/Local	2.0	1.5	0.9	4:1
Local/Local	1.7	1.3	0.7	6:1

Note:
Per Table 12-4, *Recommended Pavement Illuminance for Roundabouts, Based on Pedestrian Activity Classification* of IES/ANSI RP-8-18 publication.

5.3 Flashing Stop Signs

Studies have shown that flashing stop signs provide significant beneficial effects on daytime and nighttime stopping compliance and are effective in reducing stop sign violations. The 2014 California Manual on Uniform Traffic Control Devices (CA MUTCD), Section 2A.07 (or the most recent relevant section) provides standards and options for the usage of Light Emitting Diode (LED) units within the face of a sign and in the border of a sign to improve conspicuity and increase the legibility of sign legends and borders. This policy outlines the requirements that must be met for a flashing LED stop sign to be installed at City of Encinitas maintained intersections.

POLICY

Installation of a flashing LED stop sign can be considered by the City Traffic Engineer at locations that meet at least 3 out of 5 criteria below. City Traffic Engineer may implement LED stop signs at any stop-controlled intersection if staff evaluation finds it beneficial.

1. At least 3 susceptible to correction collisions during last 12 months
2. Located within ½ mile of school, park, or other major pedestrian generator
3. At least 30 pedestrians/bikes crossing study approaches during the peak 15-min period
4. At least 3 vehicles running Stop sign during peak hour (directional)
5. Distance from nearest controlled intersection is at least ½ mile

5.4 Sharrows

CA-MUTCD suggests sharrows may be used for the following reasons:

- Alert road users and assist with lateral positioning of bikes within a shared lane
- Alert road users and assist with lateral positioning of bikes on wide lanes (14'+) and to encourage safe passing of bicyclists by motorists when width allows
- Reduce incident of wrong-way bicycling

CA-MUTCD does not recommend using sharrows on roadways with speed limits of 35 mph or higher (allowed under certain conditions but not recommended).

The City of Encinitas Active Transportation Plan (ATP) was finalized and adopted in 2018 and identifies different roadways recommended for to be marked as Class III bikeways (sharrows). Projects recommended in the ATP can be adjusted or modified as needed by the City Traffic Engineer based on site conditions and network connectivity. City is in the process of evaluating the ATP to determine feasibility and benefits of sharrow projects identified. Where there is available pavement width or funding for a Capital Project, the city preference is to construct a Class I bike path or Class IV separated bikeway.

Based on the recommendations of CA-MUTCD and current adopted documents of the city, following is the proposed sharrow usage policy for the City of Encinitas. The following policy only applies to which roadways would be recommended for sharrows. For design aspects such as lateral positioning, spacing and other specifications, sharrow guidelines in section 9C.07 of CA-MUTCD (or the most recent relevant section) will be continued to be used.

POLICY

1. Sharrow markings may only be placed on roadways with speed limits of 35 mph or less, subject to the criteria below.
2. Sharrow marking can be placed on all roadways identified by City of Encinitas ATP as a Class III Bikeway unless City Traffic Engineer's opinion is that addition of such sharrows may create a false sense of security for the bicyclists.
3. For roadways not on ATP list, sharrow markings may be placed on a roadway if two or more of the following conditions are met and/or if conditions (a) and (b) are met by 70%.
    a. If the bicycle volume of the roadway during the 2-hour peak biking period is 60 bikes/hour or higher
    b. If the average daily traffic on the roadway is 1000 vehicles/day or higher
    c. On one-way roads
    d. On roads with parallel on-street parking with outer lane width between 12' and 17'
    e. On roads with one or more bike vs vehicle collision within the past 5 years if the issue is susceptible of being fixed with addition of sharrows/
4. The City Traffic Engineer will continue to have the authority to implement sharrows on different roadways of the city based on Encinitas per municipal codes 14.08.030 (or the most recent relevant code) and 14.16.020 (or the most recent relevant code) when deemed necessary or may decide not to implement sharrows on a street if in their opinion, if would not improve cyclist safety.

5.5 Marked Crosswalks

Purpose

The main function of marked crosswalks is to channelize pedestrians to desirable paths of travel across streets at intersections or mid-block locations. Crosswalks alone at uncontrolled locations do not guarantee the safety of pedestrians, therefore careful consideration of their location and any additional warning devices is essential. This policy provides standards for when to install crosswalks at uncontrolled locations, and for when they must be accompanied by other traffic control devices.

Summary

This policy provides the requirements uncontrolled pedestrian crossings must meet in order to be considered for a marked crosswalk, how a crosswalk must be marked, and the process of removal, if necessary.

If a location meets each of the Basic Warrants below and scores a minimum of 16 points in the Point Warrants, it qualifies for a marked crosswalk. Point Warrants are indicated in Table 1. In addition, crossing treatments and/or warning devices must accompany the crosswalk. Table 2 identifies categories for crossing treatments that are needed based on thresholds of vehicle volumes and crossing distances. Table 3 lists the crossing treatments for each category.

For unusual conditions not identified in this policy, engineering judgment should be used to apply these guidelines or adjust them to fit individual field site conditions. These guidelines are not intended to be a substitute for engineering knowledge, experience or judgment.

In addition, any removal of a marked crosswalk must follow the procedure outlined in the California Vehicle Code.

Basic Warrants

Each of the following warrants must be satisfied in order for an uncontrolled location to be considered for a marked crosswalk.

- Pedestrian Volume Warrant

  The pedestrian volumes must be equal to or greater than ten (10) pedestrians per hour during the peak pedestrian hour. Children under 13, elderly over 64 years and/or disabled persons count as 1.5 pedestrians. Alternatively, this warrant can be satisfied using Latent Pedestrian Demand if conditions (a), (b), or (c) under Table 1, T1.1b are met.

- Approach Speed Warrant

  The 85th percentile approach speed must be equal to or lower than 40 MPH. This warrant does not apply when a pedestrian hybrid beacon or a pedestrian traffic signal will be installed.

- Nearest Controlled Crossing

  The proposed location must be farther than 250 feet from the nearest controlled pedestrian crossing (measured from the nearest edge of the proposed marked crosswalk to the closest edge of the controlled crossing).

- Visibility Warrant

  The motorist must have an unrestricted view of all pedestrians at the proposed location for a distance required by the following table (stopping sight distance is to be interpolated when 85th percentile speed is between 5 mph increments):

85th Percentile Speed (MPH)	Stopping Sight Distance (feet)
25	150
30	200
35	250
40	300

- Illumination Warrant

  The proposed location must have existing lighting.

- Accessibility Warrant

  The proposed location must have existing accessibility to disabled pedestrians or have accessibility improvements programmed.

Point Warrants

Point warrants are the number of points a location is required to meet (in with the Basic Warrants above) to qualify for a marked crosswalk. Sixteen points are required and can be achieved through pedestrian volumes or latent pedestrian demand, general conditions, and/or the average gaps in traffic. A summary of each Point Warrant and the allocation of points are presented in Table 1. A discussion of each Point Warrant variable follows the table.

Table 1: Point Warrants

T1.1a Pedestrian Volume Warrant		
Number of Pedestrians (Peak Hour)	Points	Total Available Points
10 – 25	4	10
26 – 50	8	
51+	10	
T1.1b Latent Pedestrian Demand Warrant (in lieu of Pedestrian Volume Warrant)		
Condition	Points	Total Available Points
(a) The proposed crosswalk is in a commercial, mixed land use, or high density residential area.	3	10
(b) A pedestrian or shared use path is interrupted by a restricted crossing.	3	
(c) A pedestrian attractor/generator is directly adjacent to the proposed crosswalk as defined in the explanatory notes below.	4	
T1.2 General Condition Warrant		
Condition	Points	Total Available Points
(a) The nearest controlled crossing is greater than 300 feet from the proposed crosswalk.	3	18
(b) The proposed crosswalk will position pedestrians to be better seen by motorists.	3	
(c) The proposed crosswalk will establish a mid-block crossing between adjacent signalized intersections or it will connect an existing pedestrian path.	3	
(d) The proposed crosswalk is located within ¼ mile of pedestrian attractors/generators as defined in the explanatory notes below.	3	
(e) An existing bus stop is located within 100 feet of the proposed crosswalk.	3	
(f) Other factors.	3	

T1.3 Gap Time Warrant		
Average Number of Vehicular Gaps per Five-Minute Period	Points	Total Available Points
0 – 0.99	0	
1 – 1.99	1	
2 – 2.99	8	
3 – 3.99	10	
4 – 4.99	8	
5 – 5.99	1	
6 or over	0	10
Total Available Points		38

Table 1, Explanatory Notes:

T1.1a Pedestrian Volume Warrant

The Pedestrian Volume Warrant assigns point values based on pedestrian crossing volumes at the proposed location. Children under 13, elderly over 64 years and/or disabled persons count as 1.5 pedestrians.

T1.1b Latent Pedestrian Demand Warrant (in lieu of Pedestrian Volume Warrant)

The Latent Pedestrian Demand Warrant may be used in lieu of the Pedestrian Volume Warrant.

T1.2 General Condition Warrant

The General Condition Warrant presents six (6) unique categories. A location can score either zero (0) or three points for each unique category, making a total of 18 points possible. The general conditions include the following:

The nearest controlled crossing is greater than 300 feet from the proposed crosswalk.

The distance should be measured from the proposed location of the crosswalk to the nearest controlled intersection, i.e. stop sign, traffic signal, etc.

The proposed crosswalk will position pedestrians to be better seen by motorists.

This condition should be considered at locations where one leg of the intersection

provides better sight distance than the other legs or midblock location with better sight distance.

The proposed crosswalk will establish a mid-block crossing between adjacent signalized intersections. This warrant refers to a condition where there is a major pedestrian attractor/generator nearby, and an adequate crossing can be provided that could help channelize a heavy flow of mid-block pedestrians.

Crossing Treatments

Crossing Treatment Thresholds

If the proposed crossing location meets the criteria set by both the Basic and Point warrants, the next step is to evaluate the most appropriate crossing treatment(s) to be installed with the marked crosswalk. Marked crosswalks at streets that have less than 1,500 ADT can be installed with signs and markings alone. Table 2 provides thresholds for determining whether additional treatments are required prior to installing a marked crosswalk. The thresholds are based on vehicle volumes, vehicle speeds, and pedestrian crossing distance at the proposed location. Location types are divided into categories A, B, C, and D, and are used to determine the appropriate treatment for the proposed marked crosswalk location.

Table 2: Crossing Treatment Thresholds for Uncontrolled Marked Crosswalks if Warrants are Met

Crossing Distance2	Roadway ADT (vehicles per day)									
	< 1,500	1,501 – 5,000		5,001 – 12,000		12,001 – 15,000		> 15,000	
< 40’	A	B		B		C		C	D1
40’ to 52’	A	B		C		C	D1	D	
> 52’	A	B	C1	C	D1	D		D	
For streets with more than one lane at an approach or posted speed limit 30 mph or greater. Crossing distance can be measured to a pedestrian refuge island if one is present.									

Table 3 below presents treatment requirements for the categories shown in Table 2. As new devices or treatments are proven, they may be considered in lieu of these treatments, with the City Engineer’s approval.

Category	Crossing Treatments
A	The following is required: ·(W11-2) Pedestrian Warning Signage with the corresponding (W16-7P) arrow plaque as shown in CA MUTCD Section 2C.50 (or the most recent relevant section)
B	At least one of the following is required: (R1-6) State Law – Yield to Pedestrian sign if median is present Rectangular Rapid Flashing Beacons (RRFBs) Raised crosswalk or other traffic calming treatments if the City's Guidelines are met
C	At least two of the following are required: Radar Speed Feedback Signs Striping changes such as narrower lanes, painted medians, road diets, or other speed reducing treatments. RRFBs Staggered crosswalks and pedestrian refuge island Horizontal deflection traffic calming treatments1 if the City's Guidelines are met
D	A Traffic Signal is required if the CA MUTCD warrants are met and it is recommended by a traffic engineering study. Otherwise at least one of the following is required: Pedestrian Hybrid Beacon if the CA MUTCD warrants are met Horizontal deflection traffic calming treatment1 with RRFBs if the City's Guidelines are met
1. Horizontal deflection treatments include, but are not limited to: roundabouts, pedestrian refuge islands, and pedestrian pop-outs.	

Stop Controlled Crosswalks

At stop controlled intersection approaches, stop signs control both the motorist's and pedestrian's behavior, rather than crosswalk markings. The warrants reflected in this policy do not apply at stop controlled intersection approaches. At such approaches stop bars define pedestrian paths. A marked crosswalk may be installed at a stop controlled intersection on a case by case basis if a clear benefit to pedestrians is demonstrated. Examples of such demonstrated benefits are:

An all-way stop controlled intersection where at least one street is a one-way street with more than one lane, and marking the far side crossing will highlight pedestrian crossing (all approaches that pedestrians are allowed to cross should be marked in this case).

An all-way stop controlled intersection where pedestrians are restricted on one or more legs and marking the alternate crossing routes will highlight where pedestrians are allowed to cross.

RRFBs shall not be for crosswalks across approaches controlled by YIELD signs, STOP signs, traffic control signals, or pedestrian hybrid beacons. RRFBs should not be used for the approach or egress from a roundabout unless recommended and approved by the City Traffic Engineer following an evaluation.

Removal of Crosswalks

It shall be the Policy of the City to follow the California Vehicle Code requirements when a crosswalk is considered for removal.

The California Vehicle Code, Section 21950.5 (or the most recent relevant code), states the following:

An existing marked crosswalk may not be removed unless notice and opportunity to be heard is provided to the public not less than 30 days prior to the scheduled date of removal. In addition to any other public notice requirements, the notice of proposed removal shall be posted at the crosswalk identified for removal.

The notice required by subdivision (a) shall include, but is not limited to, notification to the public of both of the following:

That the public may provide input relating to the scheduled removal.

5.6 Speed Legends

BACKGROUND

Pavement markings are an essential part of traffic control measures and are used to provide visual cues to drivers, helping them understand the rules of the road and navigate safely. They are typically painted using durable, reflective materials to ensure visibility both during the day and at night.

Speed limit markings are usually found on the roadway surface and are typically rectangular in shape. They include numerical values indicating the maximum speed limit allowed in that specific area. These markings are often painted using white or yellow paint, depending on the local regulations and standards.

The painted speed limit markings (speed legends) help reinforce the speed limit by providing a clear visual reminder to drivers. They are typically placed adjacent to speed limit signs at regular intervals along the road, particularly in areas where the speed limit changes or where it is important to emphasize the designated speed.

Studies indicate that speed limit pavement legends can reduce 85th percentile speeds by 1 mph on rural, main roadways[1].

Advantages:

- Inexpensive.
- Helps reinforce a change in speed limit.
- Does not slow emergency vehicles.

Disadvantages

- Has not been shown to significantly reduce travel speeds.
- Requires regular maintenance.

POLICY

Streets must meet 2 out of 3 criteria below to be eligible for speed legends:

1. Street is classified as a residential street or is unclassified in the most recent version of the Encinitas Mobility Element of the general plan or meets the criteria to be classified as a Residence District per CVC 515 (or the most recent relevant code) or CA-MUTCD 2B.13 (or the most recent relevant section).
2. Street has an 85th percentile speed of 7mph or more over the current posted speed limit in both directions.
3. Street has an Average Daily Traffic (ADT) of 1000 vehicles or higher.

5.7 Speed Feedback Signs

BACKGROUND

The primary purpose of speed feedback signs is to enhance road safety by increasing driver awareness of their speed and encouraging them to adjust their driving behavior accordingly. The signs are equipped with radar or laser technology that detects the speed of approaching vehicles. The detected speed is then displayed on the sign, often in bright, easily visible characters. Speed Feedback signs do not capture or record speed data, they provide direct driver feedback only.

There are different types of speed feedback signs available, but most commonly, they can be categorized into two main types:

1. Static Signs: These signs display the driver's speed in a straightforward manner. They usually consist of an LED display that shows the speed in large numbers. The numbers may be accompanied by additional information such as a speed limit reminder or an encouraging message to slow down.
2. Dynamic Signs: Dynamic speed feedback signs incorporate additional features to further engage drivers and influence their behavior. They often include flashing lights or animated elements to draw attention to the sign. For example, if a driver exceeds the speed limit, the sign may flash or display a warning symbol. Conversely, if the driver is within the speed limit, the sign may display a positive message or a smiling face.

The effectiveness of speed feedback signs in reducing speeding and improving road safety has been supported by various studies[1]. They serve as a visual reminder to drivers, making them more conscious of their speed and encouraging them to adjust their behavior accordingly. The signs are particularly useful in areas where traditional enforcement methods, such as speed cameras or police presence, may be impractical or less effective.

Overall, speed feedback signs play a valuable role in promoting safer driving behavior by providing drivers with immediate feedback on their speed and encouraging them to adhere to speed limits.

POLICY

Streets must meet 2 out of 4 criteria (if criteria 2 is met) or all other criteria (If criteria 2 is not met) below to be eligible for speed feedback signs:

1. Street is classified as a residential street or is unclassified in the most recent version of the Encinitas Mobility Element of the general plan or meets the criteria to be classified as a Residence District per CVC 515 (or the most recent relevant code) or CA-MUTCD 2B.13 (or the most recent relevant section),
2. Street has an 85th percentile speed of 7mph or more over the current posted speed limit,
3. Street has an Average Daily Traffic (ADT) of 500 vehicles or higher,
4. At least one major pedestrian generator including schools, parks or other public facilities utilizes the street.

City of Encinitas Neighborhood Traffic Management Program

April 27, 2005

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Table of Contents

1.0 Introduction

Safe, pleasant residential streets that allow Encinitas residents to walk, bicycle, and socialize have been a City priority for many years. Policies and practices to encourage neighborhood traffic to proceed at appropriate speeds and through traffic to use major streets were implemented in 1991. Some neighborhoods that have been affected by those policies are satisfied, but others have concerns that have not yet been addressed. These concerns prompted development of a more comprehensive program to provide options for addressing neighborhood traffic issues and clearly define the implementation process. This handbook explains the Neighborhood Traffic Management Program.

Citizen Involvement

Encinitas citizens have first-hand knowledge and experience of traffic patterns and concerns in their neighborhoods. Every resident was invited to provide input to help identify key elements of the neighborhood traffic program. Several hundred citizens attended workshops to contribute their insights and suggestions during early stages of program development. Many more provided comments via email and letters. This input helped shape a program that provides citizens with information and tools to help them collaborate with the City to manage neighborhood traffic efficiently and effectively.

Hundreds of Encinitas residents participated in two workshops to provide input for this program.

1.1 How to Use the Handbook

The handbook is divided into 6 sections. Sections 1.0 and 2.0 provide an overview of the neighborhood traffic management program that will be useful for all readers.

Section 3.0 describes the process that is followed to initiate, design, and implement a neighborhood traffic management plan. It includes a flow chart that visually illustrates the steps required to complete the process. This section will be useful for all readers.

Section 4.0, Toolbox, explains different techniques that can be used alone or in combination with other tools to manage neighborhood traffic. This section is vitally important to the program and useful to all readers, but training to help residents understand this section will be incorporated into the first two neighborhood meetings associated with initiating a Neighborhood Traffic Calming Plan process. Residents may find the summary in the chart on page 28 a useful tool for selecting which treatments they would like to study more closely.

Sections 5.0 and 6.0 are oriented to the designer who will assist residents with the development of their neighborhood traffic management plan. These sections discuss many of the elements the designer must consider before preparing preliminary plans.

2.0 Neighborhood Traffic Management: Program Overview

Mission Statement: Develop and oversee a program that will encourage vehicles to use circulation element streets; reduce impact of vehicular traffic in neighborhoods; and improve pedestrian, bicyclist and equestrian safety within and around the City of Encinitas. Adopted by the Traffic Commission, December, 2001

2.1 Program Purpose

The purpose of managing neighborhood traffic flow and speed is to enhance safety and preserve community character in Encinitas neighborhoods. An expanded plan to manage neighborhood traffic has become necessary for those residential areas experiencing more traffic and excessive speeds.

Concerns about increasing traffic and speeds are prevalent throughout the United States. Americans are driving more than ever. Commute distances are longer and the number of trips they take are increasing. A typical single family detached home in the San Diego area generates 10 daily trips. Estate homes generate 12 trips per day. This means that even residents in areas with little traffic from outside their neighborhood may notice a substantial number of vehicles passing by their home every day.

In some neighborhoods, the street pattern may create short-cuts that attract drivers who are trying to avoid congested areas. Their short-cuts are referred to as cut-through routes. Some Encinitas residents feel their neighborhoods are experiencing cut-through traffic that has created excessively high *traffic volumes* on their streets.

In addition to concerns about traffic volume, many residents are concerned about traffic *speed.* Most Encinitas residential streets are posted for maximum speeds of 25 mph. Unfortunately, signs don't guarantee compliance. Many factors influence a driver's selection of travel speed. For example, the width and length of a street affects the driver's sense of what is an appropriate speed for the environment. The number of people visible, amount of landscaping, weather conditions, number of cars parked, and many other factors are quickly processed by the driver's mind to select a speed. The driver's temperament, trip

"Make street environments that are safe, efficient, and pleasant for all transportation system users—pedestrians, bicyclists, automobiles, skateboarders, horseback riders, transit, etc. It should create integrated systems that fit into the environment." Citizen Statement, March, 2003

purpose, and time schedule are other considerations. The result is that many drivers do not adhere to the posted speed limit.

Balance User Needs

Citizens who provided input to help develop this program emphasized balancing the needs of all who share Encinitas streets. The sample statement in the box on the previous page reflects the perspective of many citizens. They expressed their desire for living in areas that are friendly, neighborly, and have a sense of community. They wanted safe, peaceful neighborhoods and identified low traffic volume and low speeds as a major determinate of quality of life in Encinitas.

Most California citizens also place a high value on quick and easy motorized access to streets that carry them to work, school, highways and freeways, or other destinations. It is important to recognize the need for adequate, moderate speed collector streets to meet this need.

The Neighborhood Traffic Management Program seeks to reconcile the desire for quick and efficient mobility and that for quiet, low-speed streets by designing a street environment that functions well for people inside vehicles as well as for those who are not inside a vehicle.

The first step in this process is to design pedestrian-friendly neighborhood streets. In a pedestrian-friendly environment, people feel safe walking, the environment is comfortable, access to destinations is convenient, and they understand where they are and how to get where they want to go. Children and others who do not drive autos are less reliant on others for their transportation in pedestrian-friendly areas. Some workshop participants suggested that creating more pedestrian-friendly areas could help reduce the number of daily trips made to and from Encinitas households.

Bicyclists, skaters, and others using various types of non-motorized wheeled devices also share streets with motorized vehicles and pedestrians. Whether for play or for transportation, these street uses are permitted and will be considered during the process of developing neighborhood traffic management schemes.

Traffic management must also address the needs of those inside motorized vehicles. This program strives to provide convenient, efficient routes of travel for motorized vehicles. It also addresses the needs of those who provide various neighborhood services, including the occasional moving van, garbage service, and emergency service providers.

Community Character

Street design has a profound impact on the appearance of neighborhoods and the functioning of a community. Wide, sterile streets with limited landscaping encourage faster speeds and are less desirable places to live. Many of the tools in the traffic management program have the potential to enhance community character with added landscaping, reduced asphalt area, or more defined and orderly parking spaces. Many residents value the character of rural-style streets that have no curbs or gutter, but without proper treatments these streets sometimes encourage higher speeds.

2.2 Traffic Management Areas

Designing one street to slow or limit traffic can impact residents and traffic on parallel streets or other streets in the vicinity. For this reason, the Encinitas program approaches traffic management from a neighborhood perspective, rather than a street-by-street program.

For purposes of this program, neighborhoods will be defined primarily by existing boundaries such as freeways, major roads, beaches, rivers, creeks, or railroad tracks. For example, one traffic management neighborhood near the ocean might be bounded by N. Coast Highway 101, the beach, and streets such as La Costa Avenue, Leucadia Boulevard or Encinitas Blvd. Another is bounded by I-5, N. Coast Highway 101 and the same cross streets mentioned previously. Traffic management areas east of I-5 are challenging to define because development patterns vary and often include many cul-de-sac and curvilinear streets.

The optimum neighborhood size for effective traffic management outreach, public involvement, and construction is one square mile. In neighborhoods that exceed this size, collector streets or other features will be used to sub-divide the neighborhood into smaller segments. Ideally, traffic management area boundaries will define areas where neighbors share a sense of place and will work collaboratively to develop a traffic plan that enjoys broad neighborhood support.

Neighborhood boundaries will be defined by staff with input from citizens.

2.3 Techniques

There are many techniques, or tools, available for managing neighborhood traffic. These include traditional signs and markings, enforcement, education, and traffic calming treatments. A variety of tools are included in this program to allow Encinitas residents and staff many alternatives when developing a traffic management plan.

Traffic control devices include stop signs, traffic signals, speed limit and other signs, and street markings. These traffic control devices require enforcement to achieve driver compliance. Education is often used to encourage voluntary compliance and understanding of the devices.

Traffic calming treatments are changes in the street used to reduce the ability of drivers to travel at high speeds and to limit access to certain streets. This is accomplished by using one or more treatment alternatives to create a street environment that either requires drivers to steer over or around a street feature, or to take an alternative route. Other elements such as painting stripes on the street, landscaping and signing do not force a change in driver behavior, but they provide visual elements that may prompt people to drive more slowly.

The tools available to manage traffic in neighborhoods are discussed in detail in Section 4.0 beginning on page 21.

2.4 Street Types

Tool selection will be influenced by the nature of the neighborhood street and sidewalk system and by objectives established by

residents. Streets and sidewalks provide a network of routes that allow access to destinations via foot, bicycle, or motorized vehicles. Some Encinitas streets are primary routes to commerce, nearby freeways, and work or activity centers. The Neighborhood Traffic Management Program was developed to address neighborhood streets that primarily serve residential areas. Many of the options for neighborhood streets are not appropriate for larger, primary routes. Criteria and standards for these larger routes are addressed in the City's Circulation Element.

Typical rural-style residential street in Encinitas.

Rural-style Streets

There are many two lane undivided rural-style streets in neighborhoods throughout Encinitas. These paved streets are generally about 24 feet wide and do not have curbs, gutters, or sidewalks. As shown in the photo of a typical rural-style residential street, people walking in these areas are forced into the vehicle travel lanes. Many rural-style streets are winding, hilly streets that limit the ability of drivers to see people, animals, parked cars, or other objects within adequate braking distance. In some areas vegetation at street edges limit driver visibility. Rural-style streets send a message to drivers that the area is rural and it is appropriate to drive fast.

Cars parked on unimproved shoulders in front of homes line both sides of some Encinitas streets. Drivers often park several feet further from the street edge than they would on a street with curbs. In effect, this widens the usable roadway and allows faster speeds, especially around corners. Drivers are able to maintain higher speeds around corners because they can drive on the shoulder.

Some people feel the lack of curbs, gutters, and sidewalks creates a rural environment that would be lost if curbs and gutters were installed. It is harder to manage traffic on streets that do not have curbs and gutters because drivers can maneuver around many traffic calming measures. It is possible to install steel posts or other solid objects to prevent this action, but these objects are often ugly.

Another option is to install curbs and gutters that define a narrow street. As shown in some of the images on pages 10 and 11, streets with curbs, gutters, and sidewalks can have a natural feel if they are narrow and well-landscaped. These streets provide a better balance between user needs than rural-style streets that do not have curbs.

Suburban-style Streets

Suburban-style streets are paved and have curb and gutter. Suburban streets usually include sidewalks. Many have planter strips between the travel lane and sidewalk. They provide the safest and most comfortable

environment for all users when they are only 24 feet wide, with on-street parking encouraged. As shown in the photo on the right, some existing suburban-style streets in Encinitas do not have sidewalks. Parents are reluctant to let their children walk in the street because they are exposed to passing vehicles. To optimize safety, new streets and streets that are reconstructed should include sidewalks or other pedestrian paths and planter strips on both sides where feasible. See Section 2.5, Sidewalks and Crossing for additional information.

Suburban streets in Encinitas include some with sidewalks, as shown below, and some with curbs and gutters, but no sidewalks, as shown above.

Local streets such as the one above primary provide access to residences.

Example narrow local street with sidewalks, planter strips, and on-street parking.

Street Classifications

Both rural and suburban-style streets in Encinitas are classified by their function. Classifications include local, collector and arterial streets. These classifications are a consideration when selecting traffic calming measures or traffic control devices most appropriate for the street.

Local Streets

Local streets primarily serve as access to residences. Existing local, or residential, streets in Encinitas vary in paved width from 18 to 50 feet.

Collector Streets

Collector streets provide connections between arterial streets and local streets. The Encinitas Circulation Element designates which streets are collector streets based upon the need to provide a network that allows motorists to access arterials and freeways. Development patterns play a major role in determining which streets are designated as collector streets. In neighborhoods with many connecting streets,

traffic tends to be distributed evenly on each street throughout the street system. Neighborhoods with cul-de-sacs and loop streets concentrate traffic onto a few collector streets. Wide collector streets can create a barrier to pedestrian and bicycle movements across a neighborhood. Vehicle speeds are generally higher on wide streets.

Arterial Streets

Arterial streets provide long distance travel routes across and between cities. They are usually 4 to 6 lanes wide and often include medians, planter strips, and sidewalks. Arterial streets are designed to handle more traffic than is normally expected on local and collector streets.

Typical two-lane collector street in Encinitas.

Typical three-lane collector street in Encinitas.

2.5 Sidewalks and Crossings

One of the objectives of neighborhood traffic management is to create more pedestrian-friendly neighborhoods. Sidewalks and defined pathways are essential features of a safe walking environment. Walking in the street because there are no sidewalks may feel safe and comfortable to a normal, healthy adult if traffic volume and speed is low, but it presents a hazard to children, people in wheelchairs, those with visual or hearing impairments, and those who may be slower to see and react to the presence of a vehicle. Crash data from across the U.S. clearly indicates there is a higher probability of injury when walking in areas with no sidewalks. These are random events that happen seldom, but can have tragic outcomes. For Encinitas to become pedestrian-friendly, sidewalks or defined pedestrian paths are needed on both sides of streets where

The City of Encinitas allows sidewalk and path-way materials such as decomposed granite to complement the character of a neighborhood. Applicable standards must be followed.

children play or walk to school and where friends and neighbors walk and socialize. Sidewalks can be attached to the curb, as shown in the image on the right, or separated from traffic with a planter strip, as shown in the lower photo. The planter strips provides space for landscaping and separates walkers from moving traffic. Natural or decomposed granite walkways are also appropriate in some areas.

The Encinitas Recreational Trails Master Plan contains a map of a citywide trail system and guidelines for materials and trail locations. Hard and soft surface paths are identified in the plan, as well as sidewalk connections within the trail system. Traffic management plans must be compliant with the Plan and City sidewalk standards.

Ease in crossing the street is also a key factor in designing a pedestrian and bicycle-friendly environment. The Traffic Calming Treatments section of the Toolbox includes features that can be used to minimize the length of time a pedestrian is in the street. Short crossing distances and slower vehicle speeds contribute to the comfort and security of people crossing the street.

Typical suburban local or collector street with sidewalks attached to the curb. This street is 40' wide from curb-to-curb.

Narrow, suburban local or collector street with sidewalks separated from traffic by a planter strip.

2.6 Bikeways

Bicyclists also share Encinitas streets. Their needs and concerns are important and must be considered during the development of neighborhood traffic plans. Two types of bikeway facilities that should be considered when preparing Neighborhood Traffic Management plans are described below. The City's Master Bikeway Plan should also be consulted.

Bike Paths (Multi-Use Trails)

Paths and trails that are separated from streets can provide a quiet, comfortable bicycling and walking environment. Multi-use trails add value to adjacent properties and can often provide short-cuts that link together areas that are less accessible to motorized vehicles. Trails are problematic when they parallel streets in areas with many driveways and cross streets because there is a potential

conflict at each driveway and intersection. For this reason, multi-use trails are best when located in corridors away from streets. On-street bicycle facilities may be more practical when routes are adjacent to a street.

Bike Lanes

Bike lanes are designated areas in the street adjacent to the vehicle travel lane. They are included as a tool in the traffic calming treatments because adding bike lanes to existing streets will help reduce lane widths, which contributes to slower speeds. Bike lanes in neighborhoods are most applicable on collector and residential streets carrying more than 1,500 vehicles per day.

2.7 Street Network

Street networks can have enormous impacts on traffic volumes in residential streets.

An interconnected street network either the historic grid network or an interconnected network of curved roads produce the lowest traffic volumes on any one street and on the arterial road network. These street networks minimize service costs, provide the highest level of accessibility to emergency vehicles, and produce the lowest number of internal trips because so many trips can be done be walking or bicycling.

Cul-de-sac style development with single entrances produce very light traffic volumes on the tops of cul-de-sac and very high volumes where the cul-de-sac development connects to the arterial road. Therefore, there is a huge disparity of traffic volumes for people living within this style of development. Because they are typified by single connections to aerial roads, they generate much higher traffic volume on arterial roads and greatly increase turning movement at major intersections.

These types of developments also generate a higher number of internal trips because of limited mobility for pedestrians and bicyclist within the development.

Because of people's fears and lack of knowledge of how to calm traffic, interconnections between neighborhoods are fought and often prevented. The results are longer travel distances affecting more people within their neighborhood, lowered emergency response times and higher service costs.

Therefore, to minimize emergency response times, service costs and the number and length of trips a well-interconnected street system is the long-term goal.

Identification and construction of the "missing links" within the existing street network as traffic calmed link is another goal to reduce emergency response times, trip lengths and the number of trips.

2.8 Private Roads

Many private roads have been constructed and more are likely to be constructed. If residents on these streets wish to implement traffic calming, they are encouraged to follow an abbreviated version of the process described in this Manual and their Covenant, Conditions and Restrictions. Funding will be at the cost of the Homeowners Association with the review and approval of the City.

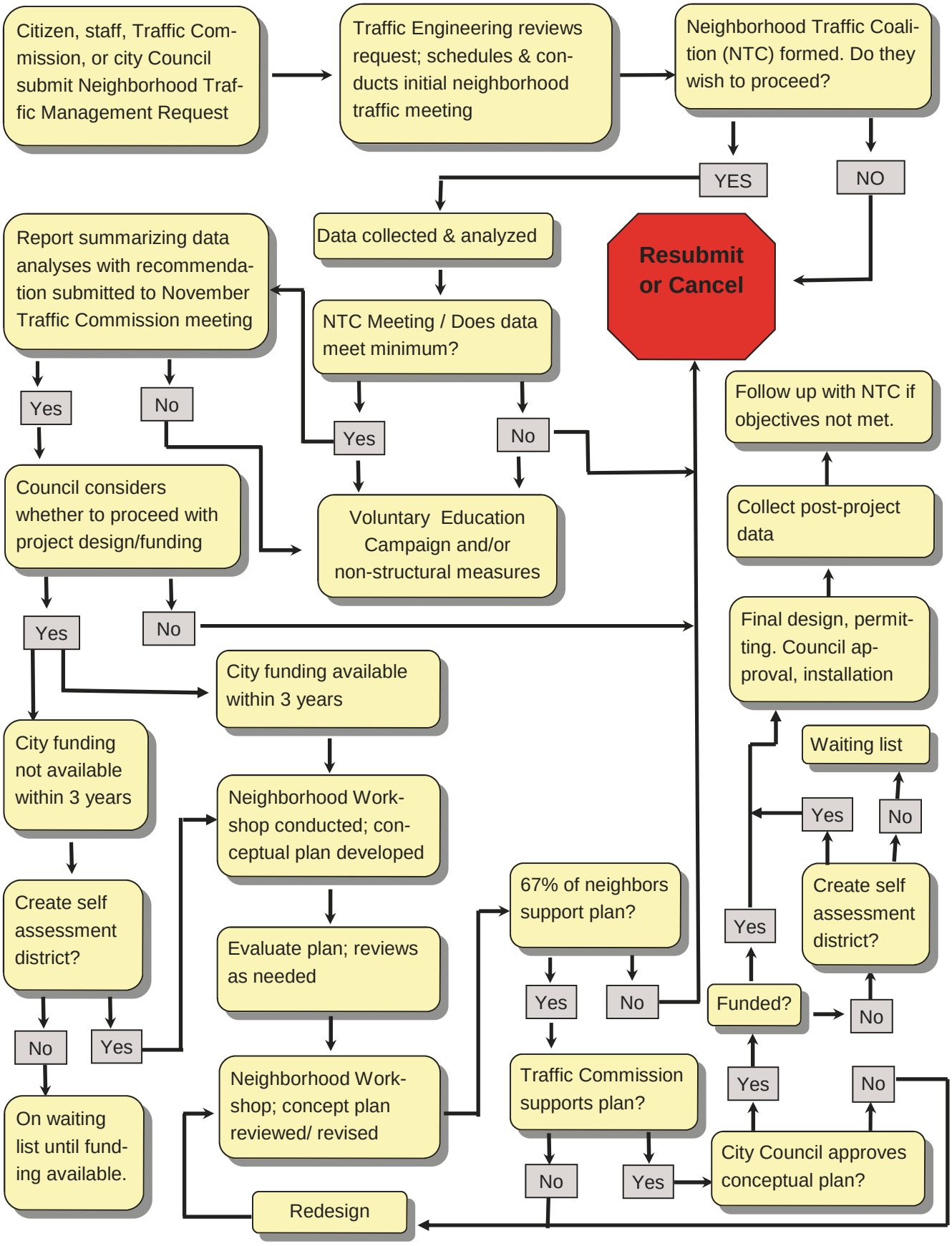
2.9 Removal and Modification to existing treatments

Over time the traffic pattern changes, the range of treatments widens, the mix of residents along a street changes and therefore a review of past traffic management projects become desirable. A review may be initiated by the residents, or the City. A review would consider the initial conditions, changes, reasons for the change, and a review to see if the change is warranted.

If warranted, a public workshop of the affected residents is held to consider the change, the data and if there is consensus, the change could be implemented and funded by the initialing body.

Project Development Process

Figure 1



3.0 Process

This section describes the process to develop and implement a neighborhood traffic management plan. The chart on page 14 illustrates the steps in the overall process. Each step is described in detail below.

3.1 Neighborhood Traffic Management Request

The process to develop a traffic management plan for any neighborhood can be initiated by residents, staff, City Council, or by a vote of the Traffic Commission.

A *Neighborhood Traffic Management Request* must be completed, signed by ten residents, and filed with the Engineering Department. The request provides preliminary information regarding the nature and location of the traffic concern. This will provide staff with information needed to conduct a field review to prepare for the preliminary neighborhood meeting.

A request can be filed at any time, but it must be received by October 1 to be considered for inclusion on the ranked list that will be developed and submitted to the Traffic Commission during November of each year.

Residents from ten different households on at least four streets in the neighborhood must agree to attend an initial meeting to learn more about neighborhood traffic management and how it can be implemented. This core group should be willing to assist the City in efforts to encourage all residents in the neighborhood to participate if a traffic management plan is developed. They will be referred to as the *Neighborhood Traffic Coalition (NTC)*, and serve as the liaison between City staff and other residents. One resident or the party filing the request must commit to host an initial meeting of 1-1/2 to 2 hours. If a plan is prepared, this group will be a key resource in explaining details to neighbors who did not attend meetings and in gaining their support for the project.

3.2 Initial Neighborhood Traffic Meeting

After reviewing the Neighborhood Traffic Management Request and affected area, City staff will contact the Host to schedule the initial meeting. This process may take up to 90 days.

The Host is to invite the ten signatories and other interested people to the initial meeting. The agenda will include:

Host: Welcome, Introductions, and Overview of Concerns

Staff: Traffic Management Presentation explaining the program purpose, proposed neighborhood boundaries, procedures, funding options, and possible outcomes. Staff will explain when and how enforcement, signs, or other preliminary steps are feasible. Staff will respond to questions and work with residents to explore their options.

If the residents who attend the meeting represent at least 4 streets within the neighborhood and they agree to take on the role of the NTC supporting development of a neighborhood traffic plan, staff will schedule data collection for the area.

3.3 Data Collection

Data is collected to determine the magnitude of the traffic concerns in comparison to other neighborhoods requesting traffic management. Some data elements will be used to rank project priorities. If a project is implemented, data can be compared to conditions after implementation to measure success. Data collection will vary based on input provided by citizens during the preliminary neighborhood meeting. Data elements could include:

1. Speed. Speeds are recorded to quantify how many drivers exceed the speed limit. Engineers use the term, *85th percentile*, to describe the speed at or below which 85 percent of the motorists on a street travel as they pass the measuring device.

2. Cut-Through Volume. The number of vehicles that enter a neighborhood, travel through, and leave without accessing neighborhood sites.

3. Truck volumes. A truck volume count may be conducted to determine if trucks are cutting through a neighborhood.

4. Origination and destination surveys. These surveys collect data to determine the number of vehicles that are cutting through a neighborhood. To collect this information, a person is stationed at the neighborhood entry point and another is stationed at the neighborhood exit point. The type, color, license number, direction of entry and time of day each vehicle enters the neighborhood is recorded. The person at the exit point notes the same information for each exiting vehicle. This information is compiled and compared. When two vehicle details match, the entry and exit times are evaluated to see if that vehicle entered and left the neighborhood within the normal travel time plus 2 minutes. The goal is to separate through traffic from traffic entering a neighborhood to pickup or drop off people or goods.

5. Crash information. Crash records from the Sheriff's Office will be used to determine the number and type of crashes that have occurred with the neighborhood within the last three years.

6. Pedestrian Generators. Schools, parks, community centers, public facilities, or other destinations that attract pedestrians will be counted to provide information for data in Figure 2 on the following page.

7. Pedestrian counts. The number of pedestrians at a selected site(s) during a specific period of time may be counted to verify pedestrian destinations.

8. Pedestrian surveys. Observational surveys can identify where pedestrian crossings are needed and where potential conflicts exist. These may be particularly appropriate for areas near schools, playgrounds, sports complexes, or other activity areas.

9. Sidewalks and pathways. Streets within the neighborhood will be assessed to determine where sidewalks or pathways are in place to provide information for data in Figure 2 on the following page.

10. Bicyclist counts. The number of bicyclists at a selected site(s) during a specific period of time may be counted.

Data collected will be compiled by City staff.

Figure 2. Data Element Values

Data Element	Points	Basis for Points
Speed	0 to 30	Extent that 85th percentile* speeds exceed speed limit; 2 points assigned for every 1 mph over speed limit
Cut-Through Volume	0 to 25	1 point for every 5 vehicles that cut-through the neighborhood during the AM or PM peak hour on an average day
Crashes	0 to 15	1 point for every nonfatal crash and 5 points for every fatal crash recorded by the Sheriff's Department in the last 3 years
Pedestrian Generators	0 to 20	5 points for every school, park, community center, library, or other public facility within the impact area
Sidewalks or pathways	0 to 10	5 points if there are not continuous sidewalks or pathways on one side of all local residential streets or both sides of all collectors; 10 points if there are no sidewalks
Total Points Possible	100	

** The 85th percentile speed is the speed at or below which 85 percent of the vehicles travel.*

Figure 2 above shows how a value is assigned to each data element. When data such as speed and volume is gathered at more than one location within a neighborhood, points will be assigned for each location and then averaged to ensure equitable comparisons.

3.4 Follow up Meeting

The NTC will host a follow up meeting at which data gathered will be presented by staff. A total score of 51 points is required for the neighborhood to qualify for traffic calming treatments. All neighborhoods qualify for resident-based educational campaigns and signs or other nonstructural traffic safety upgrades. Education campaigns will be supplemented by enforcement as resources permit. See section 4.2 for additional information.

Figure 3. Other Factors in Project Selection

- Scheduled street or utility work
- Other construction projects
- Other engineering considerations
- Fire Department priorities
- Sheriff's Department priorities
- Consistency with the General Plan
- Consistency with the Bikeway Master Plan
- Consistency with the Recreational Trails Plan
- Consistency with other adopted City plans

The City Engineer will forward all Neighborhood Traffic Management Requests, compiled data, meeting results, and a staff recommendation to the Traffic Commission, with copies to the Neighborhood Traffic

Coalition contact member. The Traffic Commission will review staff recommendations and provide a ranked listed of projects to City Council for approval.

3.5 Preliminary Project Evaluation/Recommendation

There are many neighborhoods in Encinitas that may want to participate in the Neighborhood Traffic Management Program. A ranked list of the neighborhood by total number of averaged points received will be prepared.

Figure 3 on the previous page lists factors that will influence the priority assigned to each neighborhood in addition to the data score. These factors must be evaluated by staff to ensure that resources are expended efficiently. For example, if a project is ranked first, but the street is scheduled for reconstruction soon, it is more cost effective and efficient to delay the project to coincide with other construction. Other situations such as development plans or public safety may influence priorities. Staff will prepare a recommendation that includes a full explanation of all factors considered for the November meeting of the Traffic Commission.

3.6 Council Consideration

The City Council will consider the Traffic Commission recommendation at their annual goal-setting meeting in January. Based on direction from this meeting, staff will present formal reports, project priorities, and recommendations with funding options to the Council in late February or March. Approved projects for which funding is available within three years will be scheduled for a

A neighborhood workshop will provide an opportunity for citizens to identify problems, establish objectives, learn about potential solutions, and work together to create a conceptual traffic plan.

Neighborhood Workshop as described in 3.8. Citizens in neighborhoods that are not funded within three years may elect to establish an assessment district as described in 3.7.

3.7 Assessment District

If a project does not score 51 points or is ranked lower than other projects included in the City funded work plan, funding and construction will be unavailable within 3 years. The Neighborhood Traffic Coalition may poll residents to determine if they are willing to create a self-assessment district. If 67% of property owners within the neighborhood sign a covenant agreeing not to oppose an assessment district, the Neighborhood Traffic Coalition may request that the project be included in the Neighborhood Traffic Management work plan.

Staff will provide a range of likely project costs for use in determining if an assessment district covenant is an acceptable alternative. Final costs are dependent upon the plan developed.

The self-assessment district will be formed after residents develop and approve their traffic management plan. The self-assessment district will distribute project design and implementation costs fairly among all residents within neighborhood boundaries. Refer to the City's Assessment District Policy for additional information.

Another alternative is for the neighborhood to post a cash deposit to cover estimated expenses associated with conceptual plan development.

3.8 Neighborhood Workshop

The Neighborhood Traffic Coalition for each area included in the annual Neighborhood Traffic Management Program work will be contacted to help coordinate a neighborhood workshop after funding has been identified and at other points during the process. Workshops will be open to all residents who could be impacted by the traffic management plan. Coalition members will play a key role in encouraging their neighbors to participate. Sheriff's and Fire Departments will be part of the process to provide input about problems, such as crashes, enforcement, and emergency vehicle routes.

The first of these workshops will provide an opportunity for residents to identify concerns, establish objectives, learn about potential solutions, and develop a conceptual plan with the guidance of a trained professional. This meeting allows neighbors to discuss their individual preferences, explore consequences, settle any differences of opinion, and reach consensus.

3.9 Plan Evaluation/Review

The conceptual plan developed during the first neighborhood workshop reflects the advice and wishes of the neighborhood. Their concepts must undergo an engineering evaluation to refine the ideas, ensure that the measures proposed by the community are appropriate for the locations selected and objectives defined, and regulatory requirements can be met. The Sheriff's Department, Fire Department, and other City or regulatory entities will be included in the plan review as required. When necessary, staff may recommend a different treatment or placement.

It is the policy of the City to require traffic management treatments to be aesthetically pleasing and consistent with the character of the community for which they are designed. The Department will not recommend approval of plans which fail to meet this criteria.

3.10 Follow-up Neighborhood Workshop

After the review a preliminary layout will be prepared and presented at a follow-up neighborhood workshop. Once again the Neighborhood Traffic Coalition will be called upon to encourage neighbors to attend the workshop and provide feedback on the preliminary layout. The preliminary layout may include one or more alternatives. The goal of this meeting is to achieve consensus that the layout is acceptable to the neighborhood. Reaching agreement could require compromises or changes in the preliminary layout. If agreement cannot be reached during the meeting, a follow-up meeting will be scheduled where revised layouts will be

presented. After this meeting a cost estimate will be prepared.

3.11 Obtain Signatures

The Neighborhood Traffic Coalition is charged with the responsibility of obtaining the written support of 67% of the property owners within the neighborhood boundary for the proposed plan and for a covenant not to oppose a Lighting and Landscaping Sub District (LLD) to maintain the facilities once they are constructed.

3.12 Approval/Funding

After the signatures have been gathered and verified, the preliminary plan will be presented for final approval and funding. The approval process includes:

1. The Traffic Commission considers the plan. If they approve it, the plan moves to the Council. If they do not approve the plan, staff will schedule an additional workshop for the neighborhood to revise the plan. When a plan is approved by the Traffic Commission, it will be presented to the City Council for final approval and funding

2. The City Council may approve the plan or request the neighborhood revise the plan. If the plan is approved but not funded the neighborhood again has the option of creating a self-assessment district as described in 3.7. If they choose not to select this alternative, the project may be cancelled or moved to the waiting list.

In the event revisions are requested by either entity, staff will collaborate with the NTC to achieve a plan acceptable to all parties.

Projects not approved for any other reasons will be handled on a case-by-case basis.

3.13 Final Design/ Installation

Construction plans will be developed after projects are approved and funded. In some cases, the plans may call for phased implementation, with early strategies that do not require construction.

The Neighborhood Traffic Coalition will assist in the review of construction plans and in development of landscaping plans. Throughout this process, this group may be called upon to participate in discussions with impacted residents, provide input on design issues, and serve as liaison with the neighborhood.

3.14 Review

An essential step in any program is to measure the success. Following implementation of a neighborhood traffic management plan, periodic data collection will be conducted. This data will be compared to pre-project data to determine the effectiveness of the implemented plan. If the data indicates that the objectives defined by the neighborhood are not being met, a follow-up meeting will be conducted with the Neighborhood Traffic Coalition. The outcome of this meeting will determine the next steps.

4.0 Toolbox

Techniques for managing traffic range from passive approaches, such as education, to reconstruction of streets. This section contains a “toolbox” filled with potential solutions for neighborhood traffic concerns.

4.1 Traffic Control Devices

Stop signs, traffic signs, and traffic signals play a role in the management of neighborhood traffic that differs from the role of traffic calming measures. Traffic calming treatments are designed to slow vehicle speeds or divert cut-through traffic. Stop signs, traffic signs, and signals manage pedestrian, bicycle, and motorized vehicle traffic at a variety of speeds in diverse conditions. These devices, along with pavement markings, are regulated by Caltrans and by the Federal Department of Transportation to ensure uniformity throughout the United States. The regulations have evolved since the 1930’s as a method to provide uniform information to all users of the roadway.

Residents often request installation of various signs to address speeding and cut-through concerns in their neighborhoods. The conditions under which these signs are used are discussed below.

Stop Signs

Stop signs are used at unsignalized intersections where right-of-way must be regulated because of speeds, crash problems, or restricted driver views. The Manual on Uniform Traffic Control Devices (MUTCD), the document defining Federal requirements for traffic control devices, states that stop signs should not be used for speed control. It further states that they should be installed in a manner that minimizes the number of vehicles that must stop. When a stop sign is used, MUTCD specifies that it should be installed on the street carrying the lowest volume of traffic. Multi-way stops, in which traffic from all directions must stop, can be installed as mitigation for crashes or to manage vehicular, pedestrian and bicycle traffic that has reached minimum volumes specified by regulating agencies.

Intersection traffic calming treatments are more effective than stop signs in controlling speeds, reducing intersection conflicts, and maintaining a smooth flow of traffic. Residents who provided input during the development of the program envisioned replacing many existing neighborhood stop signs with small roundabouts or traffic calming circles. There may be instances where stop signs are needed either as a temporary control until a traffic calming treatment can be installed, or as a permanent installation. Residents will be encouraged to explore all other possible solutions before providing their recommendation.

Traffic Signals

Traffic signals are used at intersections that meet conditions established in the MUTCD. Their purpose is to assign right-of-way and provide for the orderly movement of traffic. They are sometimes used to interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to cross. Poorly conceived or unjustified traffic signals can

create excessive delay, contribute to red light running or other violations, cause diversion of traffic onto less adequate routes that have fewer stops, increase liability, and increase the frequency of collisions.

Traffic signals can also help to create a cut-through route through several neighborhoods by providing easy access into and out of neighborhoods. Installation of traffic signals at several intersections along a collector street can turn that street into a major thoroughfare. The added traffic impacts residents on the collector street. The installation of signals needs to be carefully regulated to avoid unintended adverse consequences.

Conservative, well-planned use of signals to complement other components of a neighborhood traffic calming plan will be considered during the development of traffic management plans for Encinitas neighborhoods. However, in most cases traffic calming treatments are preferred for controlling intersection movements because of their safety, speed reduction, traffic flow, and capacity benefits.

Other Signs

There are many other regulatory signs that meet national standards and are used to provide information and manage traffic. Speed limit signs display the maximum speed allowed under local ordinances. Unfortunately, most motorists disregard signs, especially on wide, straight streets where they feel comfortable and in control of their vehicle at higher speeds. Flashing beacons are sometimes added to speed limit signs in school zones, but even these may be disregarded unless motorists feel there is a possibility of being cited. Signs that prohibit or limit other actions such as pedestrian crossings, turning movements, and parking may also be disregarded unless accompanied by a change in street design or enforcement. Signs such as Children at Play and Deaf Child do not tell a driver what to do. Where they have been used, they usually fail to affect driver behavior.

The MUTCD recommends conservative use of regulatory and warning signs because signs tend lose their effectiveness if used to excess. Overuse of signs also leads to sign clutter that is aesthetically unappealing.

Temporary signs used to conduct campaigns to reduce speeds or raise awareness are discussed in the following section.

4.2 Education and Enforcement

The education component of the Neighborhood Traffic Management Program features brochures and website information that explain the program, why it is needed, and the steps citizens can take to implement the program in their neighborhood. Residents play a key role in distributing information about the program and in helping their neighbors understand their role in developing and implementing a neighborhood plan.

Education Campaigns

Posted speed limits are the most common form of education aimed at slowing drivers. Unfortunately, experience has demonstrated

that just posting the maximum legal speed does not compel every driver to proceed at that speed. If speed limit signs were completely effective, there would be no need for a traffic calming treatment program.

There are other education approaches designed to encourage drivers to travel at slower speeds. These include printed brochures, radio or television announcements, radar speed trailers (to show drivers their speed as they pass), and programs in which drivers pledge to drive at or below speed limits to "pace" other traffic. Some advocates suggest block parties and front-yard activities to slow traffic. Several commercial enterprises offer non-regulatory signs with slogans that encourage motorists to slow down. An example is the "Keep Kids Alive" sign pictured on the right. No data is available to demonstrate the effectiveness of the these efforts. Citizens in some communities use radar guns to record speeds and report offenders to enforcement agencies. Many of these methods are resource-dependent.

Speed trailers use radar to detect motorist speed. The actual speed is displayed beneath the posted speed limit sign. They are most effective in slowing drivers when used in conjunction with sporadic enforcement, but drivers often return to previous speeds soon after the sign is moved. The photo below shows other signs that are used in Encinitas to encourage drivers to slow down.

Resident Role

As discussed in Section 2, the character and design of streets impact driving speed. Drivers, especially those most familiar with the area, may not notice how fast they are driving. In neighborhoods where most of the traffic is generated by local destinations, an educational campaign administered by residents has the potential to raise driver awareness and result in fewer vehicles exceeding posted speed limits. This type of education campaign is simple and direct. The Neighborhood Traffic Coalition (NTC) could take the lead role in organizing a campaign.

The first step is for concerned residents to voluntarily commit to driving at posted speed limits themselves. Not only does this practice set a good example, it forces drivers behind this vehicle to also obey the speed limit.

An additional step is for concerned residents to distribute copies of the City of Encinitas brochure, *What is Traffic Calming.* The City will provide brochures to the Neighborhood

Traffic Coalition. They may choose to distribute brochures to all residents, or they may prefer to target households where offending drivers reside, visit, or provide services.

Although no empirical evidence exists to demonstrate long-lasting results from this type of educational approach, it is reasonable to expect an improvement, at least temporarily. If residents continue their educational efforts, it may be feasible to sustain educational program impacts.

Enforcement

Even the most successful education campaign cannot be expected to change the practices of every driver, just as installation of a stop sign does not guarantee compliance by every driver. Enforcement is necessary. Traffic calming treatments reduce the need for enforcement by compelling the majority of motorists to slow down to maneuver through geometric changes in the roadway. But even with treatments in place enforcement may still be needed for the occasional driver whose behavior is still unacceptable for conditions. Enforcement resources are limited, although the Sheriff's Department will continue to be responsive to resident concerns to the extend possible. Combining enforcement with a resident-based education program can help maximize these limited resources.

Combined Education and Enforcement

Research conducted by the National Highway Traffic Safety Administration shows that enforcement that targets specific areas and is accompanied by focused education campaigns can boost the effectiveness of traditional enforcement methods. These campaigns often share information about when and where enforcement will be conducted. This approach encourages many drivers to change their driving habits in that area, freeing officers to ticket the few who didn't heed the message. This stepped-up enforcement program may be repeated at random intervals in the same area until drivers change their patterns.

The NTC can conduct a neighborhood-version of combined education and enforcement program by distributing brochures and sharing information that stepped-up enforcement is expected over the coming weeks. The purpose of advising drivers to expect enforcement is to raise their awareness of driving speeds.

Summary

Voluntary education campaigns offer residents an option that can be useful while waiting for development and implementation of a traffic management plan. They also provide an alternative for neighborhoods that do not qualify for traffic calming treatments. In this case, it may be just a few drivers who are causing the problem and an educational program may complete resolve the problem.

4.3 Traffic Calming Treatments

The Traffic Calming Treatments portion of the Toolbox describes physical changes to the street environment that are intended to reduce negative effects of motor vehicle use, alter driver behavior and improve bicycling and walking conditions. Each change is considered a *traffic calming treatment.*

Most treatments achieve results by requiring drivers to go over or around a permanent feature placed in their travel path. This forced maneuver is referred to as *deflection.* Vertical deflection requires a driver to go over something and horizontal deflection requires drivers to go around something. Some treatments create *diversions* that force drivers to alter their route. Some treatments rely upon changing the driver's perception of the street. For example, visually narrowing the street with striping may change the perceived width of the street, prompting drivers to drive more slowly.

Beginning on page 29, each traffic calming treatment is described and illustrated. Appropriate locations, advantages, disadvantages and cost ranges are provided. Selection of the tools to calm a neighborhood requires careful evaluation of the impact the treatment will have on residents, those providing services to residents, visitors, emergency vehicles, bicyclists, pedestrians, and those who are cutting-through the neighborhood.

The Traffic Calming Treatment Selection Guide on page 26 provides guidance for selecting treatments best suited to the street classification, width, number of vehicles, and if the treatment is appropriate on bus or emergency service (EMS) routes. Street classifications are explained in detail on page 10. The Selection Guide and the following pages are provided to help citizens evaluate which traffic calming treatments will meet their objectives as they help develop their Neighborhood Traffic Management Plan.

Unless otherwise noted, all treatments can be expected to reduce vehicle speeds. Their exact impact on speeds will vary based on the treatment, its design, street characteristics, number of vehicles parked on the street, landscaping and other visual elements within the driver's view, and the number of vehicles, bicyclists, and pedestrians using the street.

Many traffic calming treatments can be designed to include landscaping space, which adds visual appeal to the street and improves the visibility of the treatment. The additional cost and maintenance of landscaping could be perceived as a disadvantage by some. The advantages and disadvantages of landscaping are discussed in more detail beginning on page 63, but are not listed individually under each treatment. Traffic calming treatments are divided into the following categories:

- Intersection: Treatments installed where 2 or more streets intersect.
- Non-intersection: Treatments installed between intersections.
- Other: Use of curbs, parking or stripes to reduce the actual or perceived street width

Intersection Treatments

Intersections are the highest conflict areas in the street network, making them a logical location to slow traffic. Traffic calming treatments installed at intersections impact all streets forming the intersection and often provide a visual break in a long stretch of asphalt that contributes to fast speeds. Intersection treatments can improve safety by eliminating unsafe movements, slowing turning and through speeds, improving driver visibility, and shortening pedestrian crossing distances. Vehicles parked close to or at an intersection often restrict driver visibility of approaching vehicles. Many intersection treatments overcome this by physically preventing parking. Treatments often increase sidewalk space and enhance visual appeal with added landscape area.

The needs of large vehicles, including fire trucks, moving vans, transit, school buses, garbage and deliver trucks must be considered when intersection treatments are selected. For example, a treatment that slows right turning vehicles will also slow the right turns of emergency medical service (EMS) routes.

Four intersection treatments are grouped as a subcategory entitled *Diverters*. Diverters restrict entry and/or exit routes and create circuitous routes for residents and emergency providers, which increases volumes on other streets. Neighbors working together to select treatments must consider how a diverter will impact traffic flow on other streets, as well as their own travel routes. Diverters of any type are less desirable than other intersection treatments and should be used sparingly, if at all. Cut-through traffic can be discouraged with other treatments that are less restrictive.

Non-intersection Treatments

The traffic calming treatments in this section are used between intersections, usually at intervals of 400-800 feet. They may be placed in addition to intersection treatments. Careful selection of the treatment and its location is needed to minimize inconvenience to adjacent properties.

Other Treatments

Several treatments to streets that do not create horizontal or vertical deflection can have some impact on vehicle speeds. These methods all involve changing the actual or perceived width of the street. Like other treatments, their impact will vary based on street characteristics and use. In general, treatments in this category will not produce behavioral changes comparable to those achieved by diverting traffic or requiring drivers to maneuver over or around a traffic calming treatment.

Treatment Costs

Preliminary cost ranges are provided for many treatments in the program. The number of treatments per project, drainage, street characteristics, and many other factors influence cost. The estimates were calculated for a standard design on a typical street, then varied plus or minus 20 percent. These estimates provide some budgeting guidance for planning purposes. More precise costs can be calculated after the neighborhood plan is developed.

Treatment Selection

The traffic calming treatments on the

following pages were selected for inclusion in the program based on input from citizens during workshops.

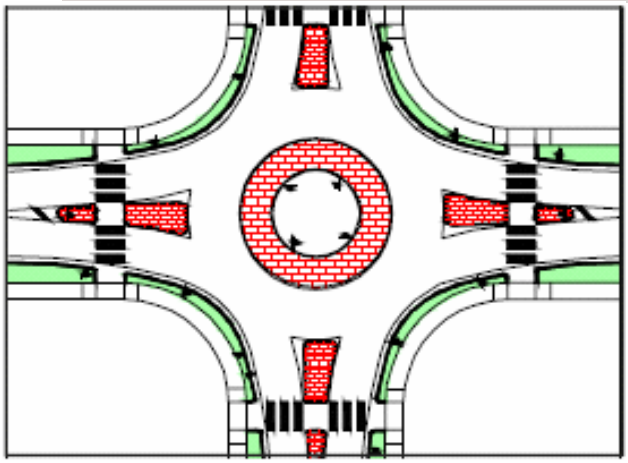
Some guidance is provided for use in evaluating treatments, but there is no formula for selecting the perfect treatment or combination of treatments. Residents must study their options, discuss the advantages and disadvantages of various treatments, and work with staff and each other to select treatments that best meet neighborhood and citywide traffic management objectives.

Traffic Calming Treatment Selection Guide

Measure	Street Width and Classification					Other Considerations		Page
	Under 26"	Over 26'	Local	Collector	Arterial	Maximum Daily Traffic Volume	EMS/ Bus Route	
INTERSECTION								
Roundabout		●	●	●	●			29
Traffic Calming Circle	●		●			5,000		31
Modified Tee Intersection	●	●	●	●				32
Intersection Table	●	●	●	●		7,500	No	33
Modified Intersection/realignment	●	●	●	●	●			34
Curb Radius Reduction	●	●	●	●	●			35
Curb Extensions/Bulb outs		●	●	●	●			36
Short Intersection Median		●	●	●				37
Gateway Treatment		●	●	●				38
Diverters								
Partial Closure	●	●	●	●			No	39
Median Barrier	●	●	●	●			No	40
Diagonal Closure	●	●	●				No	41
Street Closure	●	●	●				No	42
NON-INTERSECTION								
Oval Median		●	●	●				43
Raised Pedestrian Refuge		●	●	●				52
Short Medians		●	●	●	●			51
Median on Curve		●	●	●	●			46
Median with Tree Wells		●	●	●				45
Angled Slow Points		●	●	●		1,000 (one-lane)		48
Chicane	●		●			3,000	No	44
Driveway Link	●	●	●			3,000	No	47
Speed Hump	●		●			3,000	No	49
Speed Table	●	●	●	●		5,000	No	50
Woonerf	●		●			3,000	No	53
OTHER								
Street Narrowing - Add Curbs		●	●	●	●	20,000		54
Centerlines	●	●	●			5,000		55
Bike Lanes		●		●	●	1,500		56
On Street Parking	●	●	●	●	●			57

Roundabout

Roundabouts are circular intersections with channelized approaches. Entering traffic must yield to circulating traffic. Pedestrian crosswalks are marked one car-length from the entry and exit points. Roundabouts used in the traffic calming program will be designed for a single lane of traffic on each leg. These roundabouts will vary in size, depending upon the number, type and size of vehicles that will use them. All roundabouts are substantially smaller than large traffic circles often seen on the east coast. Traffic circles give priority to entering traffic and often use signals to control entering traffic. Unlike roundabouts, large traffic circles often operate at high speeds. Encinitas roundabouts will be designed for traffic speeds between 15 and 20 mph.



This illustration of a single-lane roundabout represents a typical design for a neighborhood street.

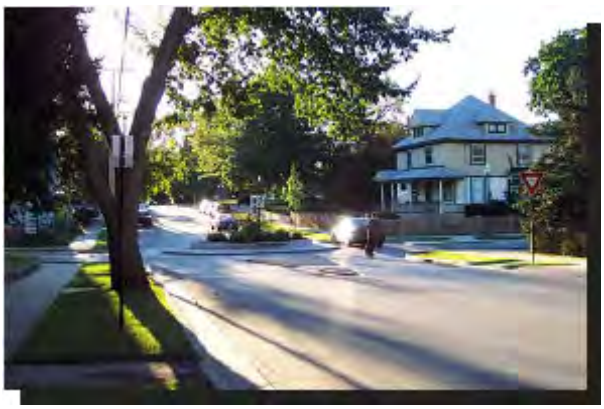
Street grades can impact roundabout design. Techniques such as providing different grades on the high and low sides of the roundabout and different elevations on each side of the central island can be used to minimize the impact of street grades.

Roundabouts vary in size depending upon street characteristics, traffic volume, and other factors. The roundabouts above and below are both in Fort Pierce, Florida.

Locations

- Streets over 26’ wide
- Local, collector and arterial streets
- Intersections with 3 to 8 intersecting streets and adequate right-of-way
- At sites where a small roundabout would fit, but garbage trucks, school buses, or other large trucks must turn, four options can be considered:

  - Locate roundabout at intersection before or after the one where large vehicles have to turn
  - Reroute large vehicles to another intersection
  - Add a truck apron
  - Use a raised intersection table instead of a roundabout



Advantages

- Reduces number and severity of crashes compared to two-way and four-way stop control and traffic signals
- Simplifies intersections with more than three intersecting streets
- Reduces vehicle delay and queues
- Reduces pedestrian delay
- Shortens pedestrian crossings
- Reduces pedestrian/vehicle conflict points
- Allows pedestrians to cross one lane of traffic, wait in the refuge area for a gap in traffic, then proceed
- Increases likelihood of driver yielding to pedestrians
- Eliminates conflicts between pedestrians and motorists when walk and green signals are provided simultaneously
- Increases intersection capacity
- Signal power and maintenance costs are eliminated
- Useful life of a roundabout is approximately 2.5 greater than that of a signal system [(1)]
- Eliminates driver confusion during power outages
- Slows vehicles, including emergency vehicles, without requiring them to stop unless other vehicles or pedestrians are present
- Emergency vehicles are not faced with through vehicles unexpectedly running the signal and hitting them at high speed. [(2)]

Disadvantages

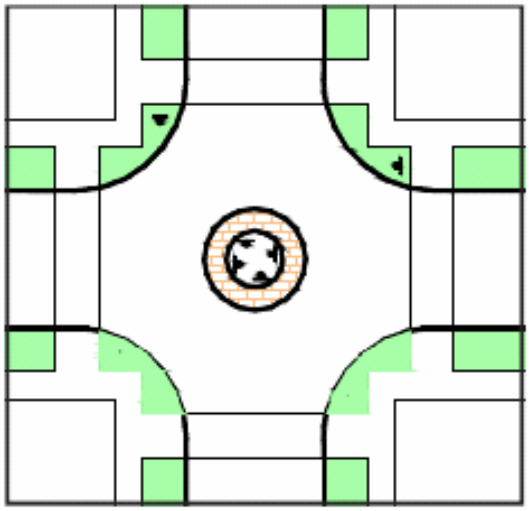
- May require additional right-of-way
- May restrict some turns by larger vehicles
- Some visually impaired pedestrians who are not trained to use roundabouts may prefer signalized intersections
- Pedestrian walk routes are more circuitous than a standard intersection
- Some on-street parking spaces may be lost

Estimated Cost:

$130,000 to $200,000

Crosswalks are located approximately one car length from the yield line at roundabouts.

Traffic calming circles consist of a raised island located in the center of an unsignalized intersection. Drivers maneuver around the central island rather than proceeding straight. Large vehicles are permitted to turn left in front of the circle. Seattle, Washington, reports intersection crash reductions of 93% following installation of these treatments. Traffic calming circles can be converted to small roundabouts by adding painted or concrete splitter islands and roundabout signing and markings. Traffic calming circles can replace two and four way stop controls on local streets.



A raised island placed in the intersection creates a traffic calming circle. Most vehicles travel around the circle as they would in a roundabout. Large vehicles such as fire trucks or moving vans are permitted to turn left in front of the circle.

Locations

- Local streets under 26’ wide, with less than 5,000 vehicles per day
- Intersections with 4 streets that intersect at 90-degree angles

Advantages

- Reduced vehicle crashes compared to stop signs
- Slows vehicles, including emergency vehicles, without requiring them to stop unless other vehicles or pedestrians are present
- Landscaping reduces appearance of a long stretch of asphalt

Disadvantages

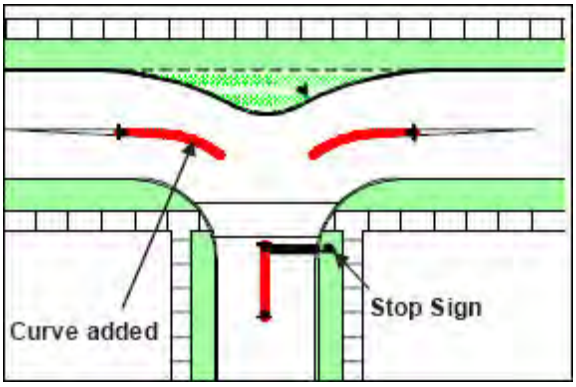
- Restricts larger vehicles
- Curb ramps may need to be relocated to remove crosswalks from vehicle path
- Wrong-way left turns could be problematic on busy residential or collector roads

Estimated Cost:

$12,000 to $18,000

Modified Tee Intersection

A curb extension added to the straight, through street at the top of a tee intersection modifies the travel path of through vehicles, forcing motorists to slow to negotiate the curve. The minor street, which terminates at the tee is controlled with a stop sign.



The illustration above shows how a typical tee intersection can be modified to deflect the travel path of drivers. As demonstrated in the photo below the driver must make a turning movement to proceed through the measure.

Locations

- Tee intersections
- Local and collector streets of any width

Advantages

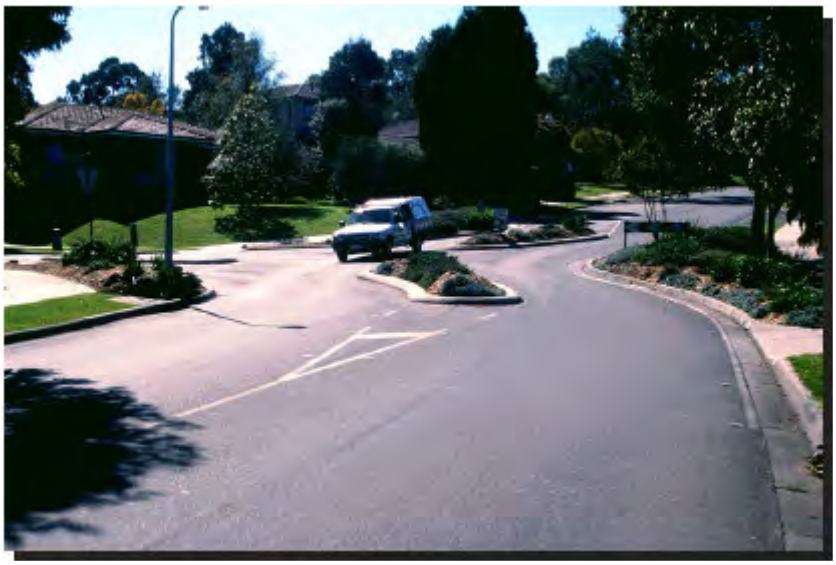
- Eliminates high speed through movements
- Can reduce through traffic on through leg of tee

Disadvantages

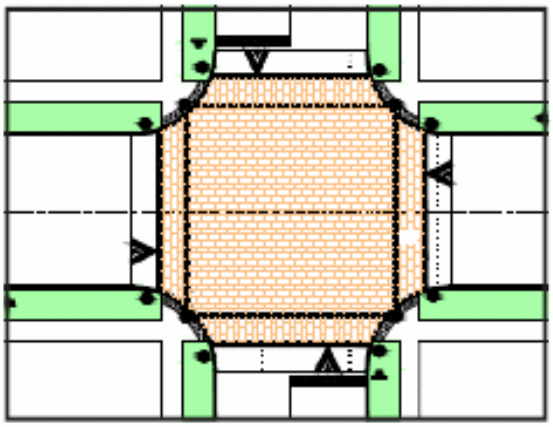
- Large through vehicles may have some difficulty maneuvering around the median

Estimated Cost:

$20,000 to $29,500



An intersection table elevates the entire intersection to sidewalk level. Ramps on all streets force drivers to slow as they enter and exit the intersection. The raised area is often brick or other textured material, which can enhance its calming effect. If textured materials are used, a smooth corridor should be provided for people using wheelchairs and other personal assistance devices. One or more bollards are placed on each corner to prevent vehicles from cutting across corner space intended for use by pedestrians.



This treatment raises the entire intersection to sidewalk level to create a table. The "V" shaped markings in the illustration above are placed on each street to alert approaching drivers to the presence of ramps. The photo below demonstrates how textures and colors can add visual impact and focus.

Locations

- Local and collector streets of any width with fewer than 7,500 vehicles per day and not on a primary EMS or bus route.
- Intersections of narrow streets where traffic calming circle or roundabout would not fit
- Intersections where a roundabout or traffic circle would fit, but large vehicles such as school buses, garbage trucks could not make turns through the traffic circle/ roundabout

Advantages

- Places a visual emphasis on the intersection and pedestrians
- Minimizes loss of on-street parking, compared to a roundabout
- Allows large vehicles to make unrestricted turns, compared to a roundabout
- Can be easier to construct than a roundabout
- Can provide accessibility solutions for narrow sidewalks [3]

Disadvantages

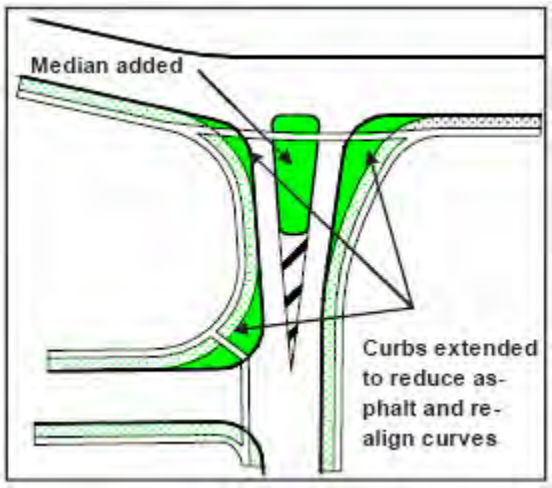
- Increases turning difficulty because drivers must go up a ramp, turn, then go down a ramp
- Emergency vehicles must almost stop at every ramp

Estimated Cost:

$100,000 to $160,000

Modified Intersection/Realignment

At some intersections, streets do not intersect at 90 degrees. This creates a skewed intersection. At other sites opposing streets are offset from each other. Some intersections have several streets intersecting on the same side of the street. In any of these situations the alignment may create large expanses of asphalt that enable drivers to turn at high speeds and create long pedestrian crossings. The principle of a realignment is to reduce the area of asphalt, realign the streets, and square any skewed approaches.



Intersections can be realigned in many different ways to tighten curves, reduce the amount of asphalt, or realign the streets. The sample in the illustration above and photo below demonstrate the principle of reducing the area of asphalt to tighten the curves and create deflection to slow traffic.

Locations

- Local and collector streets of any width

Advantages

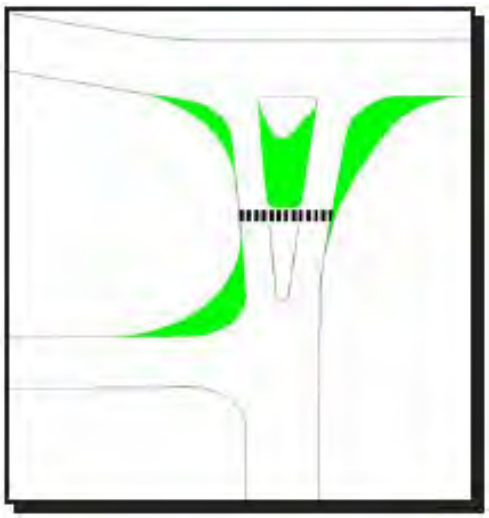
- Lower turning speeds
- Shorter pedestrian crossings
- Can discourage undesirable vehicle movements
- May provide enough additional green space to create a small park area

Disadvantages

- If not well designed, essential large vehicle movements may be restricted

Estimated Cost

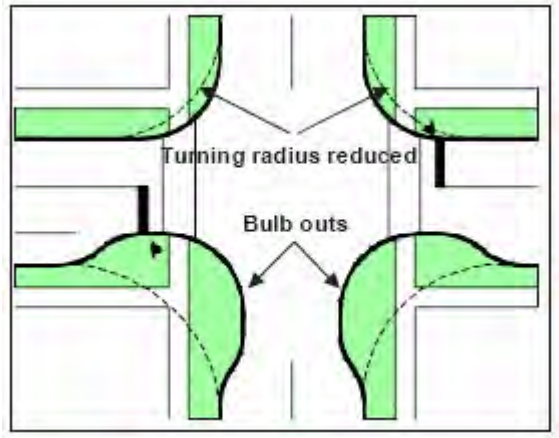
It is not possible to provide a cost estimate for this type of design because the size of the intersection street widths, angles of intersect and other factors vary from site to site.



Alternate intersection redesign with pedestrian crossing.

Curb Radius Reduction

A curb radius reduction is the reconstruction of an intersection corner using a smaller radius. A smaller radius shifts corner space from the street to the sidewalk area.



The dotted lines in the illustration above indicate the original curb line. The turning radius is reduced by extending the curb into the street. On streets with parking, the extensions can become bulb outs (see next page for details). The photo below illustrates how the extension of the curb to tighten the radius can shorten pedestrian crossing distances.

Locations

- All streets of any width
- Intersections where there are low truck or other large vehicle usage

Advantages

- Slows turning vehicles
- Can discourage cut-through traffic by forcing a driver to turn at lower speeds.
- Shortens pedestrian crossing distances
- Provides more space for curb ramps

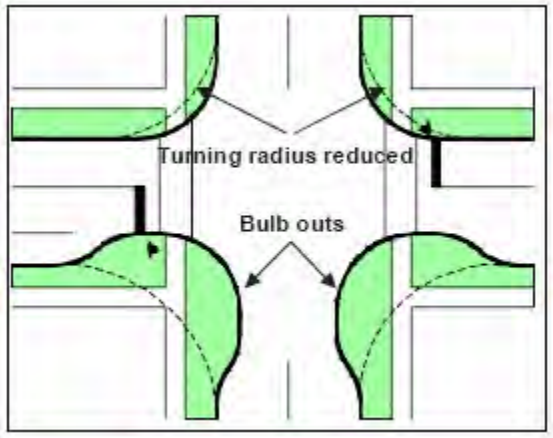
Disadvantages

- May be more difficult for some larger vehicles to turn

Estimated Cost

$6,500 to $10,000 per corner

Curb extensions, also referred to as bulb outs or bump outs, narrow the street by extending the curb into the parking lane, shoulder area, or curb lane. For purposes of this handbook, these treatments will be referred to as bulb outs. Bulb outs do not extend into bike lanes. On-street parking impacts vary depending on existing practices and other site-specific conditions.



The dotted lines in the illustration above indicate the original curb. Where on-street parking exists, the curbs can be extended to the edge of the parking area to create bulb outs. Where there is no parking, the radius can be reduced. The photo below illustrates both designs.

Locations

- All streets over 26’ wide with parking lanes, shoulder area, or overly wide curb lanes
- Downtown areas
- Near schools or other high-pedestrian activity areas

Advantages

- Shortens pedestrian crossings
- Pedestrians are more visible to drivers because the bulb out allow them to enter the crosswalk at a point where parked vehicles do not block the driver’s view
- Pedestrian can see approaching vehicles more easily
- When the curb radius is reduced by the bulb out, right turning vehicles are slowed
- Improves emergency access and side street visibility by eliminating illegal corner parking
- Provides space for curb ramps, street furniture, and landscaping
- Protects on-street parking areas
- Prevents vehicle travel in unused parking areas

Disadvantages

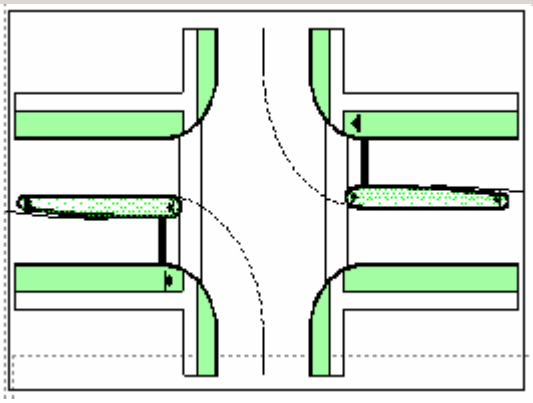
- Through vehicle speeds may not be substantially reduced unless other measures are combined with bulb outs

Estimated Cost:

$10,000 to $16,000 per corner

Short Median at Intersection

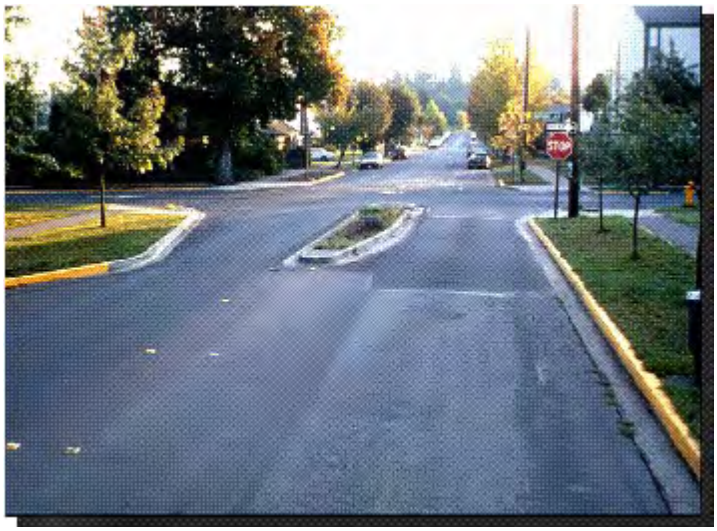
Short medians between travel lanes at neighborhood intersections can slow turning vehicles and provide pedestrians with a refuge area. A median on each leg of an intersection prevents drivers from cutting across the intersection along a very large radius and forces drivers to make a slower, sharper turn around the median. In situations where a wide exit lane allows two vehicles to exit side-by-side, the median can be used to narrow the street to a single narrow exit lane. This will discourage cut-through traffic by delaying drivers at the exit.



A short median between travel lanes can slow turning vehicles. The width of the median will vary depending on the width of the street. In the photo below, the curb on the left side has been extended to narrow the lane. Measures are often combined to

Locations

- Local and collector streets over 26’ wide
- Intersections where drivers make high speed left turns into a neighborhood
- Especially useful if drivers are descending a hill before a left turn
- Useful to delay traffic exiting the neighborhood



Advantages

- Can serve as a neighborhood gateway
- Provides pedestrian with a refuge area

Disadvantages

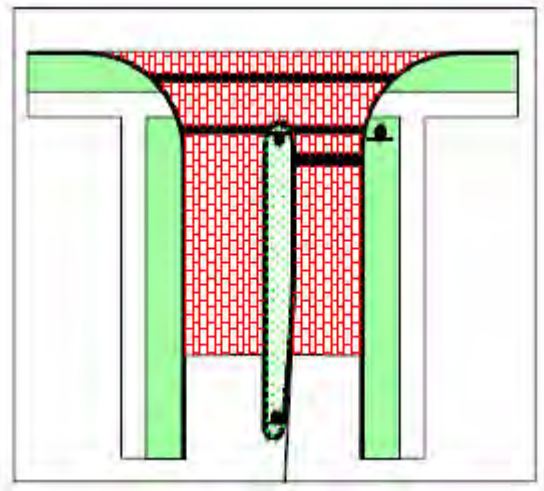
- Can restrict large vehicle turns

Estimated Cost:

$16,000 to $28,000

Gateway Treatment

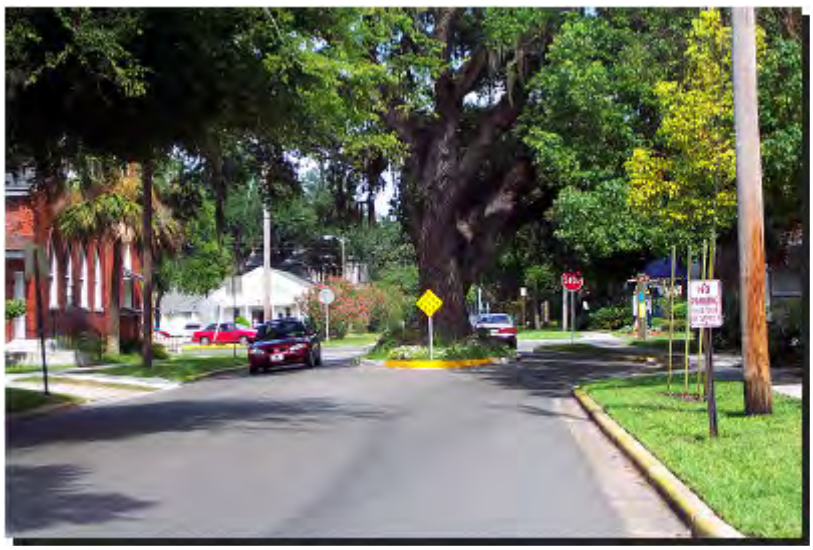
Gateways include a variety of treatments at the entrance or entrances to a neighborhood or community. Gateways announce arrival in a unique place, such as a neighborhood of downtown. Many gateways are purely aesthetic or informational and have no impact on drivers unless reinforced with additional treatments within the neighborhood. One form of gateway treatment is a short intersection median that is enhanced with textured pavement to create a physical sensation. Other examples include signs in the center median, wing walls, non-movable gates, and arches over the roadway.



A short median can serve as a gateway to a neighborhood. The illustration above shows how texture can be added. The large tree in the median below is another illustration of a neighborhood gateway feature.

Locations

- Local and collector streets over 26’ wide
- Significant entrances to neighborhoods or commercial areas
- As a divider between commercial and residential areas on the same street



Advantages

- Separates arterial street type environment from a neighborhood environment
- Strengthens neighborhood identity
- Can improve wayfinding by providing a landmark

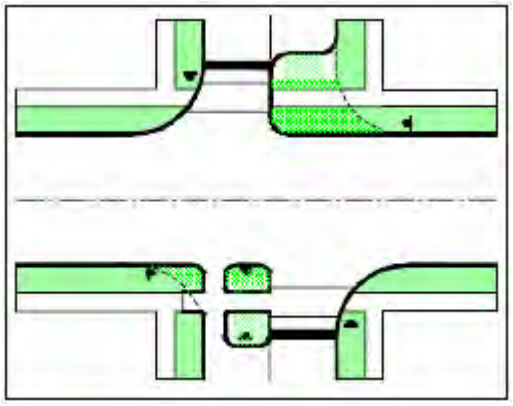
Disadvantages

- Limited effectiveness in changing driver behavior

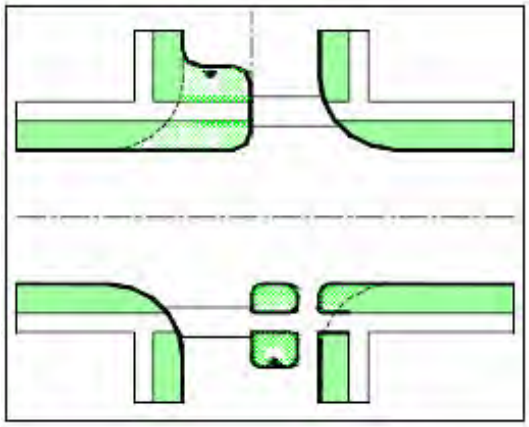
Estimated Cost:

$40,000 to $59,500

One-half of a local street can be closed at a neighborhood entry or exit point with curb extensions, bollards, or other treatments to restrict access into or out of the area. Half closures can be set up in various configurations to complement treatments on the other side of the intersection. Partial closures are rarely used because they create circuitous routes for those accessing adjacent properties. Traffic is increased on nearby streets.



These two illustrations show how a street can be partially closed to prevent traffic from continuing straight through. Various configurations can be designed to address cut-through concerns.



Locations

- Local and collector streets of any width and not on a primary EMS or bus route
- At intersections on a cut-through route

Advantages

- Eliminates cut-through traffic in one direction
- Allows two-way traffic on the remainder of the street
- Two-way bicycle access can be preserved

Disadvantages

- Restricts resident access to their property
- Inhibits access by emergency vehicle
- May cause confusion until maps reflect the change
- Increases traffic volumes on other streets
- Can impede citywide traffic circulation

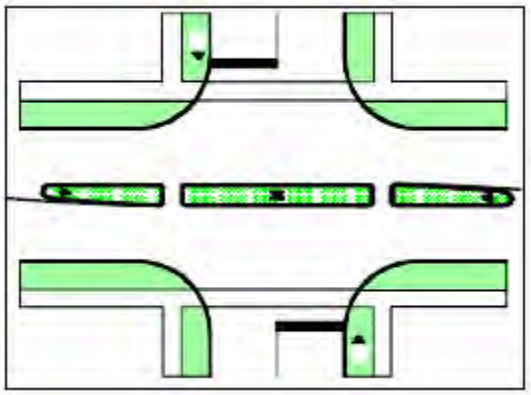
Estimated Cost:

$26,500 to $42,000

This partial closure allows traffic to exit the street, but the entry lane is blocked.

Median Barrier

A raised median between travel lanes that can extend across the intersection to block left turn and through movements from cross streets. It is a diversion tool to prevent vehicles from passing through one neighborhood, crossing a major street, and continuing into another neighborhood to create a cut-through route. Residents and service providers using that intersection can enter and leave only by turning right into or right out of out the street. All barriers that restrict traffic flow must be used sparingly to preserve convenient access and distribute traffic evenly.



A raised median through the intersection restricts access to right turning vehicles, pedestrians, and bicyclists.

Locations

- Local and collector streets of any width and not on a primary EMS or bus route.
- Intersections along cut-through routes that cross major streets

Advantages

- Median can provide a pedestrian refuge island
- Prevents cut-through traffic

Disadvantages

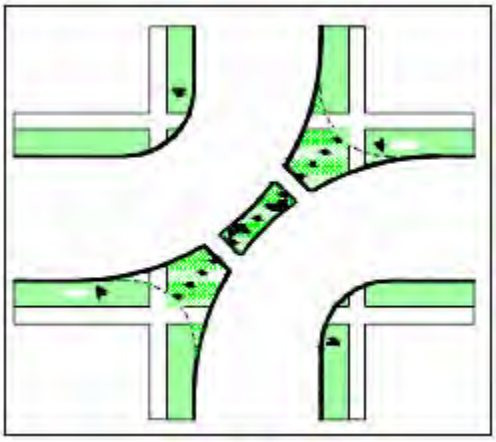
- May restrict vehicle access between neighborhoods
- Restricts resident access to their property
- Inhibits some access by emergency vehicles
- Increases traffic volumes on other streets
- Can impede citywide traffic circulation
- May cause some confusion until maps reflect the change
- Trash and silt may accumulate

Estimated Cost:

$16,000 to $22,500

Diagonal Closure

A raised median can be installed diagonally across an intersection to prevent through movements and divert traffic onto other streets. These and other partial closures are rarely used because they create circuitous routes for those accessing adjacent properties and traffic is increased on nearby streets. When used, pedestrian and bicycle access can be preserved through the diagonal median.



A raised median installed diagonally eliminates straight through vehicle traffic. The breaks in the median shown in the illustration above depict curb cuts to allow bicyclists full access.

Locations

- Local streets of any width and not on a primary EMS or bus route.

Advantages

- Eliminates through traffic
- Shortens pedestrian crossings
- Can include a bikeway connection

Disadvantages

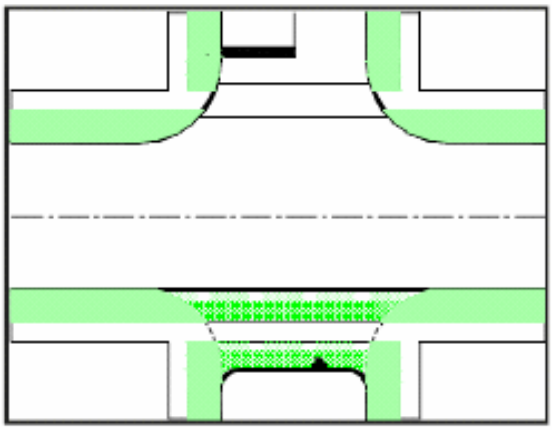
- Restricts resident access to their property
- Restricts vehicle access between neighborhoods
- Inhibits access by emergency vehicles
- May cause confusion until maps reflect the change
- Increases traffic volumes on other streets
- Can impede citywide traffic circulation

Estimated Cost:

$29,500 to $44,000

Street Closure

The most severe traffic calming treatment is a street closure. A closure prevents all vehicle access into or out of the street at that location and creates a cul-de-sac. Bicycle and pedestrian access can be retained. Bollards, barriers, and curb extensions are some of the methods used to close streets. Street closures are rarely used because they create circuitous routes for those accessing adjacent properties. Traffic is increased on nearby streets. It will be difficult to obtain approval for a closure due to the severe impact on neighborhood and citywide traffic circulation patterns.



Total closure of streets is rare because of adverse impacts on other streets in the neighborhood. When streets are closed, it can be done in a way that adds value to the surrounding area. In the photo below, a former street was converted to a linear park with a trail.

Locations

- Local streets of any width
- Streets where few properties are accessed from the street

Advantages

- Eliminates through traffic
- Reduces vehicle speeds in remainder of closed street
- Closed street can be used for a park or playground in some cases

Disadvantages

- Restricts resident access to their property
- Inhibits access by emergency vehicles
- Increases travel distances for residents, visitors and service providers
- May cause confusion until maps reflect the change
- Increases traffic on other neighborhood streets
- Eliminates an entrance to the neighborhood

Estimated Cost:

$15,000 to $22,000

Oval Median

A raised, oval-shaped median placed between narrow travel lanes forces drivers to slow to maneuver around the median. It may be necessary to extend curbs in advance of the median so driver cannot proceed straight through the curve. In such cases, the extension can become a location for trees or other landscaping features. The impact of the oval median, like other treatments, is improved by provision of landscaping. The median can also provide an island for a pedestrian crossing.

Locations

- Local and collector streets over 26’ wide

Advantages

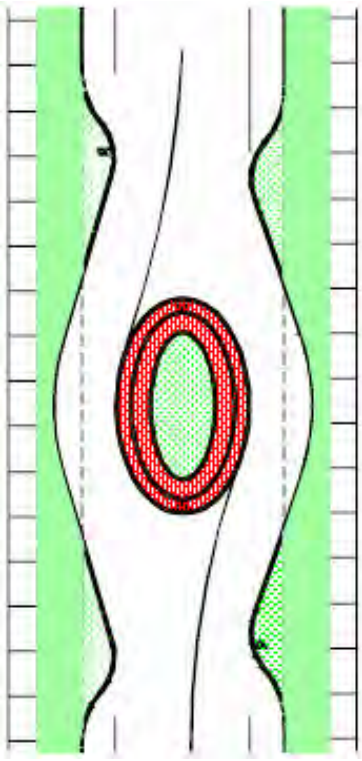
- Can be designed to different speeds
- Can provide refuge for pedestrians and bicyclists crossing the street

Disadvantages

- Requires careful design to achieve real speed reduction
- Can restrict large vehicles

Estimated Cost:

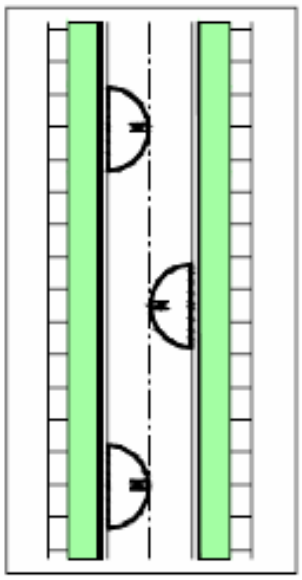
$59,500 to $90,000



A raised median in the shape of an oval is combined with a realigned curb to create a curve in the vehicle travel path. The center is often the site of a large tree or other highly visible feature.

Chicane

Chicanes are created using curb extensions that alternate from one side of the street to the other to create a single travel lane with S-shaped curves. Chicanes are sometimes referred to as deviations, serpentines, reversing curves, or twists. Chicanes rely on a curvilinear path and potential conflict between opposing traffic flows to reduce travel speeds. The design must discourage drivers from cutting straight paths across the centerline or testing their skills on the curves or speed reductions will not occur. Their use is confined to lower volume streets because traffic can pass through the chicane in one direction only.



Curb extensions on alternating sides of the street create a winding travel path wide enough for one vehicle. If another vehicle approaches, they must wait until the chicane is clear before entering.

Locations

- Local streets less than 26’ wide and not a primary EMS or bus route
- Streets with less than 600 vehicles per day
- Two-lane, two-way streets
- One-lane, one-way streets

Advantages

- Potential for higher degree of speed reduction

Disadvantages

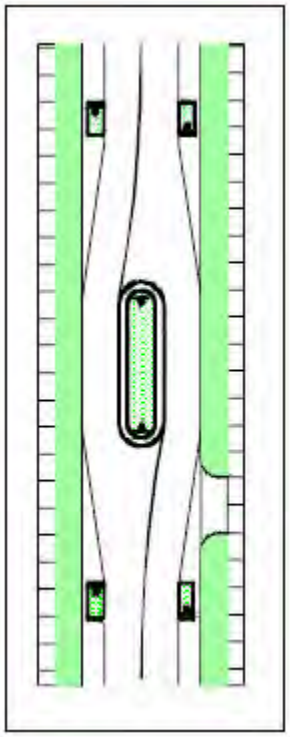
- It may be necessary to ban parking within the chicane
- Most effective where traffic volumes are balanced in each direction
- Trash may accumulate
- Bicyclists must merge with vehicles to pass through

Estimated Cost:

$12,500 to $18,500

Median with Tree Wells

A median island combined with trees wells creates a chicane effect on streets where two-way traffic must be maintained. A curvilinear path is created with curb extensions similar to those used for a chicane, but a median is installed in the center of the street to separate travel lanes. The curb extensions are generally planted with trees to increase the visual impact of the treatment.



A raised median with tree wells on either end can create an effect similar to that of a chicane, yet still allow two lanes of traffic.

Locations

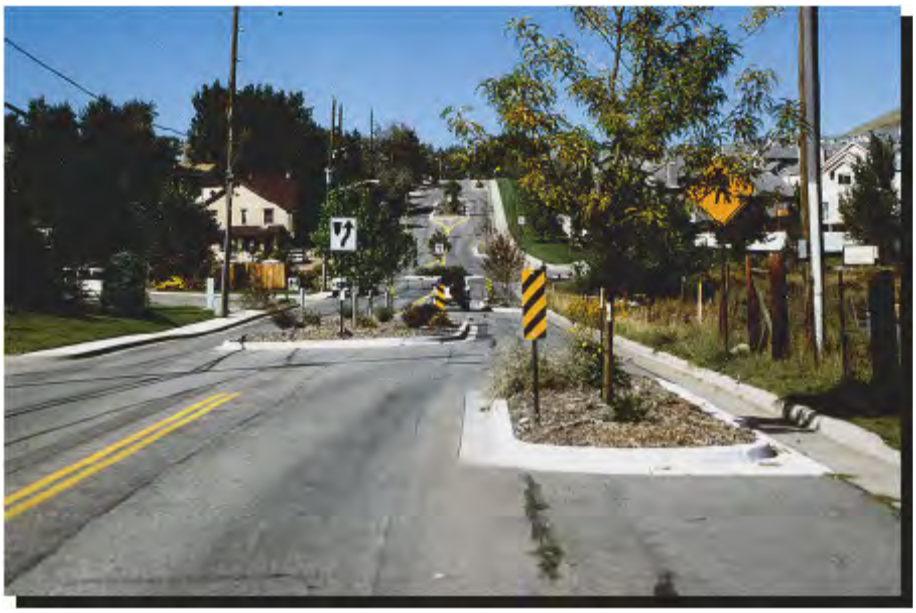
- Local and collector streets over 32’ wide

Advantages

- Enables two-way traffic
- Beautifies the street

Disadvantages

- It may be necessary to ban parking between the tree wells
- Can impact access to driveways
- Trash accumulation
- Bicyclists must merge with vehicles to pass through

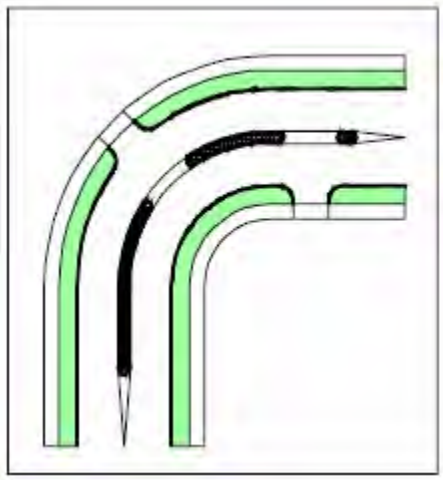


Estimated Cost:

$24,000 to $36,500

Median on Curve 46

Medians of various widths can be installed on curves to prevent vehicles from crossing the centerline to facilitate travel at higher speeds. Openings in the medians may be necessary to provide access to driveways. Raised pavement markers can be used on curves to create the effect of a median when site constraints or other factors, such as emergency vehicle access, prevent use of a raised curb.



A raised median on a curve prevents vehicles from crossing the centerline. The opening in the median allows driveway access for adjacent homes.

Locations

- All streets over 26’ wide

Advantages

- Stops drivers from crossing centerline on curves
- Prevents passing movements on curve
- Reduces travel lane width
- Can provide pedestrian refuge and shorten crossing distance

Disadvantages

- Can make travel around the curve by large vehicles difficult
- Can restrict access to some driveways unless openings are provided within the median at each driveway
- Trash may accumulate

Estimated Cost:

$13,000 to $20,000

Driveway Link

A driveway link converts a straight, two-lane street into a winding one-lane street lengths over distances of up to 200 feet. When carefully landscaped, the street appears to be closed. The narrowed road space and landscaping create a park-like appearance that enhances the street and facilitates increased pedestrian activity in that area.

Locations

- Local streets of any width
- Street with less than 1,500 ADT

Advantages

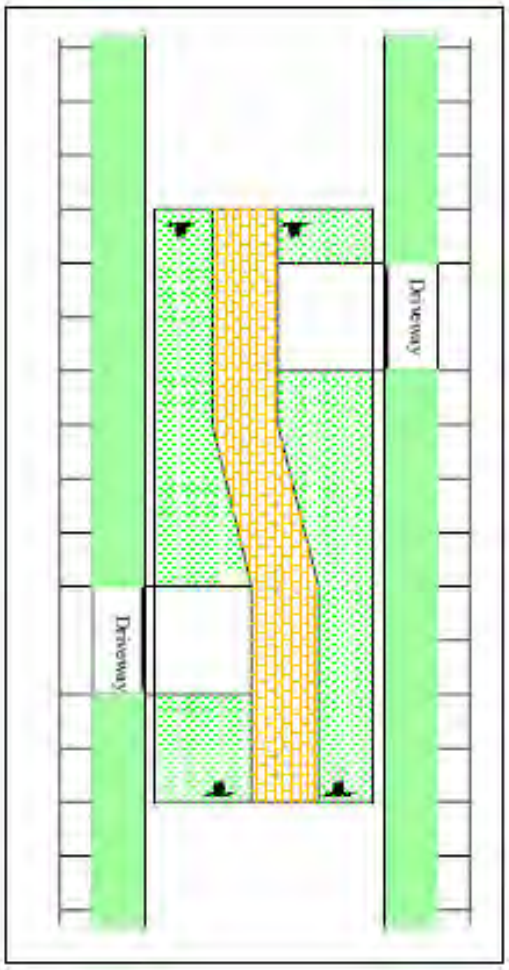
- Reallocates portions of the street to other public uses
- Creates the impression of a closed street, while maintaining the link between neighborhoods.

Disadvantages

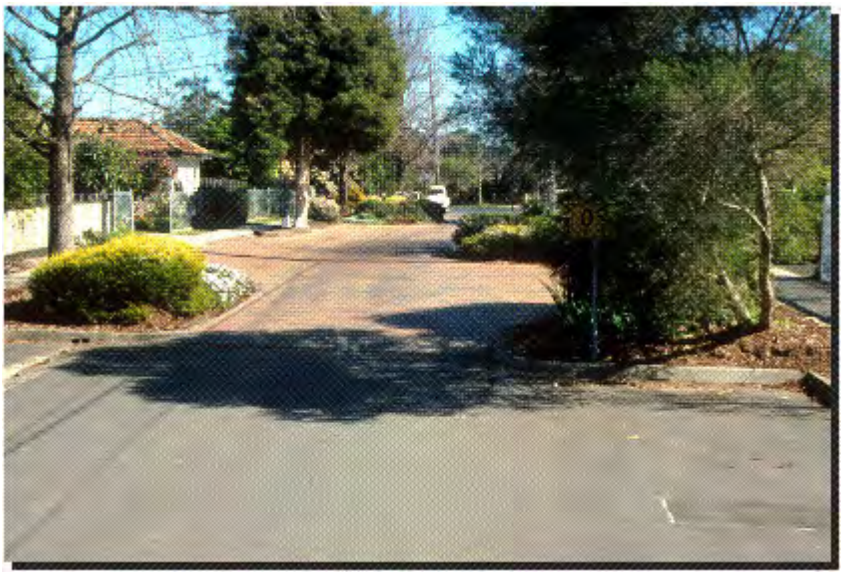
- Length of treatment is limited by cost
- Drivers must yield to each other
- Impossible to street sweep

Estimated Cost

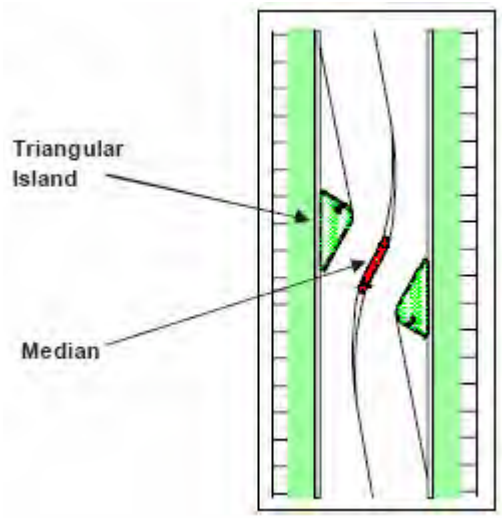
$58,500 to $99,000



The drawing above shows how a section of a two-lane street can be converted to a single travel lane. Drivers approaching the link must wait if a vehicle is approaching from the other direction..



Triangular islands constructed on both sides of a street narrow the vehicle travel path a add a curve to a straight section on street. A short median is installed between the travel lanes of two-lane slow points. Drivers must slow to negotiate the turns needed to maneuver through the curve created by the islands. On single-lane slow points drivers must yield to oncoming traffic. A raised median can be added to slow points for added deflection.



Angled slow points add a tight curve to an otherwise straight street. A median is used on two lane angled slow points to ensure drivers can't "straighten" their travel route by crossing the centerline.

Locations

- Local and collector streets over 26' wide and not on a primary EMS or bus route
- Single lane slow points on streets under 26' wide with fewer than 3,000 vehicles daily

Advantages

- Create horizontal deflection while maintaining passage for large vehicles

Disadvantages

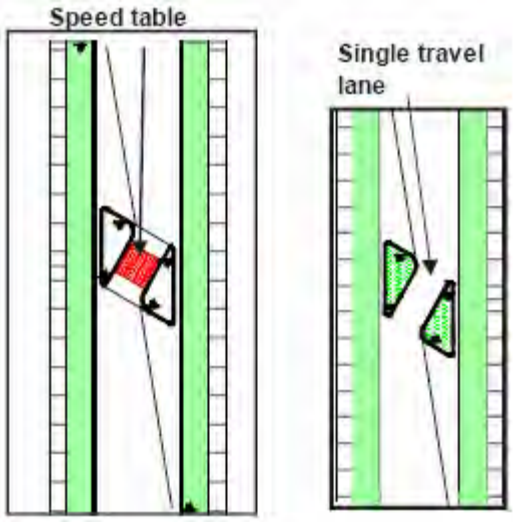
- Bicyclists must merge with vehicles to pass through
- Trash may accumulate

Estimated Cost:

Two lanes - $12,500 to $18,500

Single lane - $10,000 to $15,500

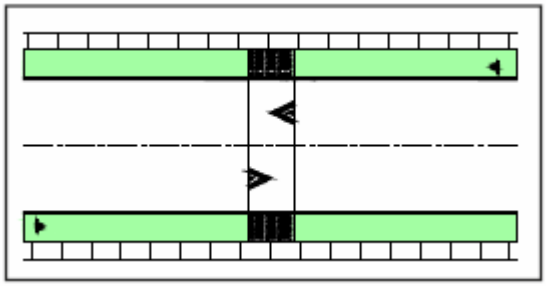
Single lane w/speed table—$13,000 to $19,000



The illustrations on the right show how angled slow points can also be single-lane. Both illustrations force traffic through a narrow, one-lane angled opening. The illustration on the right shows how a raised speed table can be added to a single lane angled slow point to create vertical deflection.

Speed Hump

Speed humps are asphalt or concrete street surfaces that span the width of the street and are raised and slightly rounded. When used in Encinitas, they are 3 high and approximately 12 feet long. Speed humps create a driving surface that is uncomfortable at higher vehicle speeds, especially when used in closely spaced pairs. The discomfort prompts drivers to slow in advance of the hump. Speed humps have a minimal impact on vehicles with good suspension systems and a severe impact on large vehicles such as buses, garbage trucks and emergency vehicles. Speed humps will only be considered where there are no other viable alternatives or where impacts are restricted to the residents of that streets only, such as on a cul-de-sac.



Speed humps are slightly rounded areas that span the width of a street to create a 3 inch rise in the street surface.

Locations

- Local streets under 26' wide and not a primary EMS or bus route
- Streets with less than 3,000 ADT

Advantages

- Bicyclists do not have to move out of their travel path to cross

Disadvantages

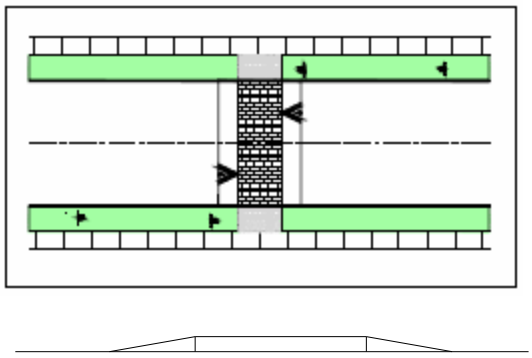
- Emergency vehicles forced to almost stop at each hump
- Vehicles braking and accelerating create noise
- Can damage vehicles at higher speeds
- Limited affect on some vehicle types
- May detract from residential property values
- Uncomfortable for passengers of buses and ambulances
- Uncomfortable for people with back injuries or other chronic painful physical conditions (3)
- Restricts mobility for people using wheelchairs if installed where there are no sidewalks

Estimated Cost:

$5,700 to $8,300

Speed Table

A speed table is an elevated, flat street surface with ramps on both sides to create a grade change on both sides of the table. A steeper grade on the approach and departure ramps will produce slower speeds. The sloped ramp leading to the platform is less jarring for vehicle occupants than a speed hump. A change in surface color and/or texture on top of the speed table can increase its effectiveness. Speed tables are effective tools for providing high visibility crosswalks schools, trails, and other mid-block crossing locations where slower speeds are desirable. They can be combined with bulb outs to shorten pedestrian crossing distances and prevent drivers from avoiding the full impact of the treatment by driving with two tires in the gutter.



A speed table is a flat surface that is slightly higher than the street. The "V" symbols in the drawing above illustrate marking to alert drivers to the ramps leading to the table. The flat surface on a speed table makes it well suited for a crosswalk. The photo below shows a speed table with a median.

Locations

- Local and collector streets of any width not a primary EMS or bus route
- Streets with less than 5,000 ADT
- Marked, unsignalized mid-block pedestrian crossings

Advantages

- More easily traversed by large vehicles than speed humps
- Provides a defined pedestrian crossing area
- Improves visibility between pedestrians and drivers
  Raises vehicles to pedestrian level
- Eliminates need for a curb ramp at the crossing

Disadvantages

- Emergency vehicles forced to almost stop at the ramps
- Can damage vehicles at higher speeds
- Vehicles braking and accelerating create noise
- Can be uncomfortable for people with back and neck problems, though less jarring than speed humps [(3)]

Estimated Cost:

$24,000 to $36,500

Raised medians of varying widths and lengths can replace two-way center turn lanes or reduce the width of overly wide streets. Medians can be designed to allow drivers full access to driveways.

Location

- Collector streets
- Streets over 26’ wide

Advantages

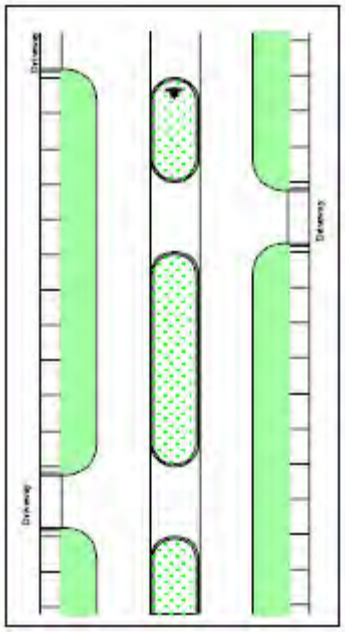
- Eliminates turning conflicts in center turn lanes
- Eliminates use of center turn lane for passing
- Can provide pedestrians with refuge area
- Can be used to narrow travel lanes

Disadvantages

- Speeds may not be reduced because no deflection is created

Estimated Cost:

$16,500 to $25,500

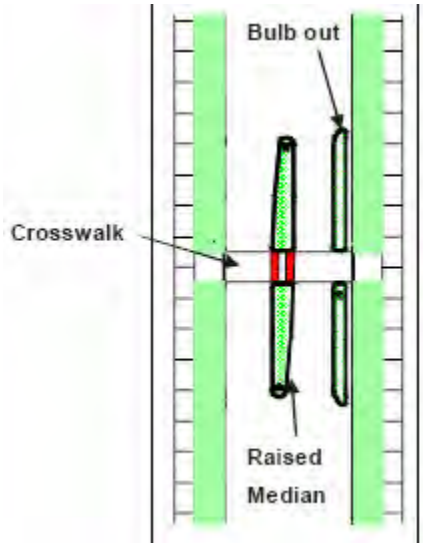


Raised medians of varying lengths can be designed allow drivers to turn into driveways.

Raised Pedestrian Refuge 52

Pedestrian islands are short medians placed in the center of the roadway separating opposing lanes of traffic. The island allows pedestrians to cross one-half of the street, wait outside the traveled way until vehicular traffic yields or there is a gap in traffic that allows them to complete their crossing, then complete their crossing. Wait and crossing times are decreased. Trees will small trunks should be planted in the refuge on both sides of the crosswalk to increase visibility of the treatment.

Other treatments such as bulb outs, narrow travel lanes and others appropriate for the street can be combined with the island to achieve desired speeds and improve motorist yield behavior.



Pedestrians can cross one-half of the street at a time when a raised median is used to provide a crossing island..

Locations

- Local and collector streets over 26’ wide

Advantages

- Provides pedestrians with safer, more convenient crossings
- Breaks up the continuous nature of the street

Disadvantages

- Must be combined with other treatments to create deflection

Estimated Cost:

$23,000 to $34,000

In the photo below a speed table and bulb out have been added to the pedestrian island.

The term woonerf is used to describe public right-of-way space that is shared by vehicles and people not in cars. The street may be designed as a play area or other public space with a single 10-foot wide lane that wanders through the former street alignment. Asphalt is usually replaced with bricks or other textured materials which are graded to direct water to low areas where drains are provided to collect water.

Locations

- Local streets under 26’ wide and not a primary EMS or bus route
- Streets with less than 5,000 ADT

Advantages

- Provides very low vehicle speeds
- Creates a shared space for everyone to use

Disadvantages

- Expensive

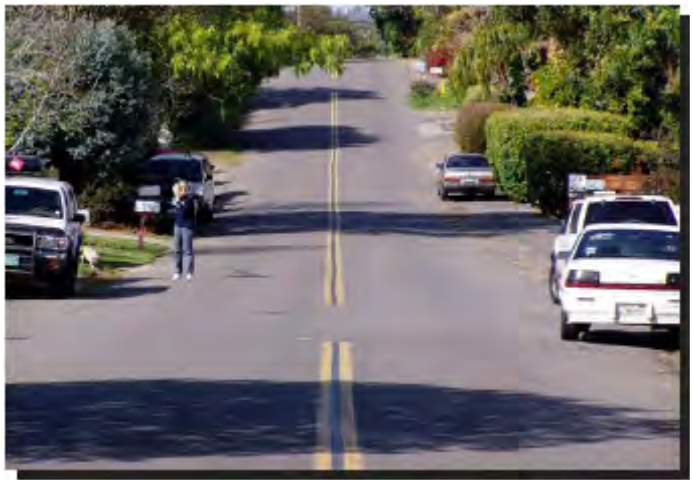
Estimated Cost

It is not possible to provide a cost estimate for this type of design without site specific details.

Narrow Street: Add Curbs

Streets without curb and gutter can create the appearance of a high-speed rural road that encourages some drivers to speed. Adding curb and gutter changes the appearance of the street to a local street and prevents vehicles from encroaching on unpaved shoulder area.

Street widths can have a significant impact on vehicle speeds. The American Association of State Highway and Transportation Officials (AASHTO) establishes guidelines for local streets 26-feet wide. This face-of-curb-to-face-of-curb width provides space for a 12-ft center travel lane and two 7-ft parking lanes. Parking on one side of the street can be allowed on streets as narrow as 20 feet. These streets function effectively because drivers can yield to oncoming cars by pulling into driveways or parking spaces that are not occupied. Reduction of travel lane width to ten feet may also yield some reduction in speeds.



These Encinitas streets illustrate how adding curbs and gutters changes the appearance of the street.

As shown in the image below, some communities provide a planter strip between curbs and the sidewalk area. Trees and landscaping are closer to the street.

Location

- Local and collector streets

Advantages

- Can help lower speeds
- Improves drainage

Disadvantages

- High cost
- Lack of universal impact on drivers

Estimated Cost:

Curb and Gutter - $35 linear foot

Centerlines

Marking centerlines that divide opposing travel lanes provides drivers with a clear indication of their travel width, location and path of on-coming vehicles. Removing or not marking a centerline creates uncertainty and helps lower vehicle speeds. This treatment may be combined with marking stripes along the edges of the street for parking or for bike lanes to yield a greater impact.

Location

- Local streets of any width

Advantages

- Low cost technique
- Reduces maintenance costs

Disadvantages

- May not be effective on all drivers

Estimated Cost:

$1.50 per linear foot to remove centerlines and add white lines on street edges

Bike Lanes

Bike lanes consist of two stripes that define the space on the street for riding bicycles. The minimum width for a bike lane adjacent to a parking lane or curb is five feet. If there are no curbs and gutters, the minimum width is four feet. The stripe can narrow the travel lanes and give the overall street a more narrow appearance. They provide many other benefits to bicyclists and pedestrians, but because they do not deflect the vehicle travel path their impact on speeds may not be significant.

Bike lanes are added to a wide street with a median in the photo above. Below, bike lanes were added to a two-lane street without a median..

Location

- Collector Streets
- Streets with more than 1,500 ADT
- As designated in the Bikeway Master Plan

Advantages

- Provides separate riding space for bicyclists
- Narrows appearance of the street
- Provides lateral separation between pedestrians and traffic
- Provides a buffer area between those entering and exiting parking spaces and the moving traffic

Disadvantages

- Not effective on all drivers

Estimated Cost:

$1.50 per linear foot to remove center line and add white lines on two edges

Vehicles parked on the street effectively reduce pavement width and can reduce vehicle speeds. Drivers are sometimes reluctant to park on the street because they fear their vehicle will be hit. Bulb-outs and tree wells along the street can protect parked vehicles while improving visibility between pedestrians and motorists.

Alternating on-street parking from one side of the street to the other on narrow streets creates a chicane-like effect. Parallel or angled parking can be used alone or in combinations. This treatment can be used in combination with landscaping to beautify the street and screen parking areas.

The street above is 30' wide from curb-to-curb. The parallel on-street parking narrows the travel area of the street. In cases where additional parking is needed, such as parks, diagonal parking may be feasible if street width is adequate. Bulb outs help prevent drivers from using parking areas as travel lanes when no vehicles are parked.

Marking of parking spaces is not necessary on collector roads or local streets unless the streets are wide and there is a need to narrow the street and encourage on street parking. On these streets a single line is all that is required.

Location

- All streets

Advantages

- Reduces street width
- Provides convenient access to abutting properties

Disadvantages

- May obscure pedestrians from drivers' view

5.0 Design Considerations

This section is oriented to engineers and designers who will assist the citizens of Encinitas with the design and implementation of their neighborhood traffic plan. Citizens will rely upon the information and tools provided in preceding sections and during neighborhood meetings to develop a plan to address their concerns. Their suggestions must be reconciled with design considerations to create a plan that reflects their wishes but is compliant with guidelines and practices of the engineering profession.

The treatments in the Toolbox include designs that create horizontal or vertical deflection to require motorists to slow down, improve pedestrian crossings, or address other concerns expressed by the public or revealed by safety data. The Toolbox includes a wide variety of treatments to address a range of problems in diverse environments with variable topography and street widths. Treatments, landscape and streetscape elements, traditional access management techniques such as raised medians and right-in, right-out turn lanes, and lane markings can be used in a variety of combinations to address speeding and high levels of cut-through traffic on neighborhood streets. Treatments are generally designed to fit into existing rights-of-way with minimal new infrastructure construction, utility relocation and repair.

Traffic management in a neighborhood must be holistic. That is, the placement of each treatment must solve problems throughout the neighborhood, and not move the problem from one location to another. The designer must consider the impacts that traffic calming treatments may have on nearby areas or the overall traffic circulation patterns.

The needs of all who share the roadway environment, including bicyclists, pedestrians, transit, delivery vehicles, emergency service providers, and passenger vehicles must be considered and balanced. Special needs for visually impaired people or those using wheelchairs, walkers, and baby strollers must be accommodated. Existing landscaping, neighborhood character, and many other contextual elements must be factored in, and the public input is of great importance in any design. Normal procedures including environmental review and Coastal Development permitting required for construction plan approval must be followed.

5.1 Project Development

Each project will include public input as described in Section 3.0, Process. This collaborative approach to traffic management ensures that the designer has a complete understanding of resident concerns. The final project is more likely to be endorsed by most residents when they have assisted in the development of the conceptual plan.

The design process starts following the Neighborhood Workshop described in 3.5, on page 17. During this meeting, citizens would have identified their concerns, learned of potential solutions, and developed a conceptual plan for their neighborhood. The first step of evaluating their plan is to conduct a site inspection to review the location of each traffic

calming treatment, take notes and check the impact on driveways, drainage structures, trees, curb lines or lack of curb, utilities and overhead lights.

5.2 Overall Design Review

Variable conditions in the roadway environment make it essential that traffic calming treatments be designed for each specific site, rather than done as a "cookie cutter" approach. The designer needs to experience the problem by undertaking field reviews to gain a complete understanding of the problem and to review site conditions. Following the site review for each treatment the designer uses the basic layouts given in the following pages to confirm that the treatment chosen by the residents is the best treatment for each location and if for whatever reason, drainage problems, utility conflicts, negative impact on driveways etc., they can change the recommended treatment to a more suitable treatment for that location.

Design Speed

Design speed is a critical element of each traffic calming treatment. Establishing design speed allows each treatment to be designed according to road function and the problem to be treated. The table below summarizes suggested design speeds for the traffic calming treatments based on functional classification of the roadway.

Roadway Classification	Design Speed
Local	12 – 15 mph
Collector	15 – 20 mph

Spacing

Each traffic calming treatment has an effective range beyond which drivers return to their previous driving habits. Treatments must typically be installed at intervals of 400 to 800 feet to obtain a consistent change in driver behavior. Treatments spaced more closely than 400 feet apart could evoke dissatisfaction among residents. Spacing treatment over 800 feet apart will provide drivers with an opportunity to reach high speeds. Varying the type of traffic calming measure requires drivers to adopt different driving techniques at each location.

Driveways

Traffic calming treatments need to be located away from driveways, or in such a way that they do not completely block driveways. Turning restrictions to ingress and egress are sometimes necessary. Driveway access at roundabouts can be preserved in many designs, and reversing into a roundabout from a driveway, in the same manner as drivers have traditionally backed into traffic, may be acceptable on a low volume street.

Intersections

In most instances, capacity at neighborhood intersections where traffic calming treatments are planned is not an issue. Topography, drainage, driveway location, radii, street width can affect treatment design. It is important that vehicle turning requirements are checked. The use of AutoTurn is encouraged to check each intersection design. In some cases the treatment suggested during the neighborhood workshop may need to be changed. In this case, the designer should document and explain the rea-

son for the change during the follow-up meeting.

In the past, some intersections were constructed at skewed angles and with very large radii. Some have large areas of asphalt and accommodate high speed turning movements. The consequence to this intersection design is that drivers who enter a neighborhood at high speeds tend to maintain or increase their speed as they move further into the neighborhood. Redesigning to AASHTO guidelines may involve realigning the intersection angles to as near as possible to 90 degrees, minimizing the area of asphalt, and channelization to minimize conflicts. Examination of existing vehicle paths can help determine the extent of asphalt needed. Excess asphalt can be changed to landscape space. Provision of a raised median on some or all of the intersection approach legs can help slow traffic, reduce the openness of the intersection and provide pedestrians with refuge islands. Often the addition of a median is more effective than simply reducing the turn radii. The use of vehicle turning templates can help determine the best design approach.

Turning Templates

The use of templates for the design vehicle when designing traffic calming treatments is essential. Determine which vehicles must travel along the route to select the appropriate template. In some cases it may be practical to make a minor adjustment to a vehicle's route so the design does not have to accommodate an occasional large vehicle. This should be a City and neighborhood decision.

Traffic Signals

Traffic signals are not a traffic calming treatment. The function of a traffic signal is to transfer time from one street to another. Anecdotal evidence suggests that drivers tend to speed up along their route to compensate for time spent waiting at a signal or in attempts to avoid a "stop" signal. Signals can, however, affect traffic calming in nearby areas. By modifying existing traffic signal phasing or duration on the collector roads, cut-through traffic can be averted. For example, the green time on the arterial or collector road that is parallel to a cut-through route can be increased to encourage drivers to stay on the main road. Signals can also be modified at the entrance to a subdivision to reduce the green time on a designated approach and discourage cut-through traffic.

Emergency Vehicles

Traffic calming treatments that are effective in slowing or diverting vehicles have the same or greater impact on emergency vehicles. Sudden vertical deflection can be jarring and uncomfortable for passengers in fire trucks, which are longer and have stiffer suspension than passenger vehicles. Vertical deflection treatments may have an even greater effect on ambulances that are transporting patients.

Most traffic calming treatments have little or no impact on emergency response time because they are mostly located in the last link (street) on an emergency response route.

Design elements can be added to treatments to improve emergency vehicle maneuvering and to allow emergency access. For example, traf-

fic circles can be built with mountable aprons which allow fire trucks to pass through an intersection without compromising the measure's effectiveness in slowing passenger vehicles. Emergency service providers are supportive of the program and must be consulted with to provide input on any traffic calming design, i.e., where mountable curb may be required to accommodate their vehicles.

Americans with Disabilities Act (ADA)

The Americans with Disabilities Act, 42 U.S.C. 12101 et seq., requires removal of architectural barriers to provide access for disabled people. Federal regulations mandate installation of curb ramps or slopes to accommodate access to streets. Any alteration to a facility which may affect its usability, such as installation of a physical device in the street or a change to the curbing or sidewalk, triggers the obligation to construct curb ramps or other appropriate accommodations for the entire facility. Most traffic calming treatments fit this criteria and the designer should be aware of any required ADA improvements at the start of design.

Sidewalks

Sidewalks should be constructed to comply with current City standards and the Recreational Trails Masterplan. The Masterplan identifies locations where pedestrian paths can be provided in lieu of sidewalks. New sidewalks should follow AASHTO guidelines that recommend placement of sidewalks as near as possible to the right-of-way. Locate sidewalks one foot from the right-of-way line to allow for variations in fence lines and to accommodate overhang from plants.

Raised Islands

Raised islands are to be constructed to acceptable standards within typical minimums of 18 inches in width and a minimum area of 50 square feet. AASHTO guidelines suggest offsets for approach vehicles are important to provide vehicles with some forgiving space. Raised islands can be solid concrete pinned to the asphalt or the road pavement can be excavated and full depth curbing provided. The interior of the islands can be filled in with plain or colored and stamped concrete, paved with brick, or landscaped. The inclusion of a gutter can permit drivers to take a slightly faster path through the treatment. Where possible the gutter should be included as part of the travel way when determining deflection. If the gutter is not needed, i.e. the road slopes away from the island, then curb only around the island is preferred.

Drainage

Design of traffic calming treatments must address drainage, as many traffic control treatments can impede existing drainage flows and patterns. An exception to City standards can be made to allow construction of a raised island within the pavement utilizing a checkered steel plate with a non-slip surface that is bolted down or a 4 to 6 inch pipe that is laid in the gutter. The sidewalk is then extended over the pipe. This is a typical drainage solution for a bulb out or speed table at a pedestrian crossing. The length of the metal plate or pipe should be greater than the width of the crosswalk or sidewalk to accommodate pedestrians or people using wheelchairs that may approach the crossing at an angle. The sidewalk or curb extension should also be

landscaped in such a manner that it discourages pedestrians from crossing outside of the pathway created by the metal plate. If the curb extension is in a site where there is no pedestrian crossing, the 18 inch gap created by the gutter shall be left open. This exception is acceptable for the installation of traffic calming treatments with existing streets only. New streets must provide adequate drainage infrastructure in conformance with City standards.

The flow area along the roadway may be constrained to the width of the gutter when a raised island is added. When water is constrained to the gutter, the upstream flow area may become wider and water will eventually flow around the raised island. For raised islands designed within these guidelines as a retrofit to an existing street, an exception to the Storm Drainage Standards can be made. A bulb out or speed table is designed to slow traffic and does not lose that characteristic during rainstorms. Traffic is expected to be moving at a speed that would preclude hydroplaning through pooled water. The designer should refer to the San Diego County Flood Control District Design and Procedures for additional guidance.

When the gutter is directed around a bulb out, the runoff flow area can extend further into the travelway. In contrast, a median constructed within an existing roadway can direct vehicles closer to the gutter and the gutter flow. Both conditions shall be acceptable under these guidelines because operating speeds are expected to be low. A speed table obstructs most of the travelway and will also obstruct the gutter flow, which are exceptions to the San Diego County Flood Control District Design and Procedures. These exceptions are acceptable for the reasons described above.

Traffic calming treatments installed on streets with unimproved shoulders generally do not have a significant impact on drainage. The designer should still exercise care in these situations to avoid creating a drainage or erosion problem.

Fire hydrants and water meters

Existing water meters and fire hydrants should be relocated to conform to current standards whenever the curb and sidewalk are relocated for traffic calming treatments. Water meters for landscape irrigation should be installed wherever landscaping is included in a traffic calming measure. Backflow prevention devices are recommended to be located in areas which are least impacted by pedestrian traffic.

Visibility

Traffic calming treatments must be clearly marked and signed in compliance with the MUTCD or according to the City's conventional practices. The MUTCD includes signs that are standard, or mandatory, and signs that are optional. Careful discrimination must be used in the selection of signs in order to prevent confusing sign clutter that could arise if all possible signs are installed.

Concrete curbs dictate vehicle paths in traffic calming treatments and should provide drivers with a smooth travel path free of kinks or sudden changes in direction. Curbs should be set back from painted gore areas on approaches to most traffic calming treatments.

Raised pavement markers should always be used to improve night visibility of traffic calm-

ing treatments. Raised pavement markers can serve two purposes in some traffic calming treatments. They delineate the road centerline during after dark hours. When closely spaced, the markers discourage drivers from crossing the centerline at any time.

Lighting and landscaping must also be incorporated into traffic calming treatments to enhance visibility and ensure that drivers can identify the object and respond appropriately. It should never be assumed that the existing lighting is adequate. Some treatments may require additional safety lighting at the discretion of the City Engineer. Increasing the lighting to suitable levels could mean installing additional poles, increasing the wattage of existing street lights, or modifying light fixtures.

Landscaping

The City of Encinitas requires that traffic calming treatments be appropriately designed to meet high aesthetic values. Appropriate landscaping is highly encouraged, together with necessary irrigation and maintenance provisions. Landscaping is an essential element of traffic calming because barren, open streets encourage drivers to speed. Trees and shrubs enhance driver identification of traffic calming treatments, provide long-range visibility, enhance neighborhood appearance, and visually narrow streets.

Landscape elements for traffic calming treatments must be selected to support a slow-speed environment. Limit shrub height to 2 foot, 6 inches in areas with driveways or pedestrians, or where sight-lines are critical. Careful selection and placement of plant materials and traffic calming treatments can improve existing sight triangles. Mid-block traffic calming treatments may contain denser plantings than at intersection treatments because sight triangles are usually less critical on straight roadway sections. Plantings with low water needs are preferred to limit saturation of base and subgrade road materials.

Trees can be planted in medians, bulb outs, planter strips, and near the edges of most

When selecting the location and size of trees, the designer or reviewer should consider the following guidelines to determine if mature size and location of plant material will affect safety:

1. Draw the approaching vehicle
2. Draw the driver's head within the standard position within the vehicle
3. Draw the tree at its mature trunk and canopy thickness
4. Draw the conflicting vehicle
5. Draw two lines from the approaching driver's head toward the conflicting vehicle that just touches each side of the tree truck
6. If the sight triangle that is developed covers less than 50 percent of the conflicting vehicle, then the driver obviously will not lose sight of it. Even at 75 percent blockage the conflicting vehicle is visible to the driver. If the coverage is greater the simple solution is to move the tree several feet away from the approaching driver and redraw the sight triangle.

streets. They should not be planted in a "clear zone." AASHTO defines the clear zone as the space between a fixed physical object and the travelway. The clear zone varies according to street function. In residential areas where vehicles travel at low speeds, the clear zone is 4 feet. In some constrained conditions, the clear zone is reduced to 1.5 feet. Where parking or bike lanes are used, the parking lane or bike lane edge is the edge of the travelway. Trees can be planted at the edge of the curb and still be within AASHTO guidelines. The visual impact of street trees is greater when they are planted close to the street. When trees are planted in median areas root barriers are recommended.

Most neighborhood streets have sewer and water pipes that need to be protected from tree roots. Tree roots typically occupy the top eighteen inches of soil where they need room to gather water and nutrients and anchor the tree. For some trees, the extents of the root system can be a length that is 1-1/2 times the height of the tree. If trees are to be planted near underground or overhead utility lines, tree type selection and the use of root barriers or concrete jackets around pipes are to be considered.

The benefits of trees include increased property value, reduction in air pollution, and a reduction in storm water runoff. (Urban trees in Vancouver collectively provide 55 million cubic feet of stormwater reduction, a benefit valued at $331.6 million.) These and other facts related to urban trees should be considered when construction costs are analyzed.

Lighting

Landscaping may impact street lighting at traffic calming treatments. Additional lights may be needed to improve or maintain after dark visibility of the street and traffic calming treatments. In the "dark" areas of the City, additional or extensive use of raised pavement markers will be required with possibly additional signing and high-visibility markings to highlight traffic calming treatments.

Maintenance Issues

The introduction of traffic calming treatments will increase street maintenance. Traffic calming treatments should be incorporated into existing curb lines when possible to minimize maintenance. The minimum radii from curb line to the beginning of a traffic calming treatment should be 15 feet to permit mechanical street sweeping. Those treatments with a radius less than 15 feet will have to be swept by hand on a periodic basis.

In some cases where pedestrian crossings are incorporated within treatments, it will be necessary to blow out the pipe under the crosswalk area.

Water must be directed around the treatment and the channel cleaned where there are no convenient drainage inlets.

Ongoing inspection and maintenance of markings and signs that identify traffic calming treatments is critical for proper operation. Traffic calming treatments are to be checked as part of the overall sign and marking inspection program.

The neighborhood has an opportunity to offer advice on landscaping as they develop and approve their neighborhood traffic management plan. The City maintains landscaping within most traffic calming treatments. If the

landscaped area is less than 100 square feet, the City may require the neighborhood to provide maintenance or replace landscaping with concrete.

Where irrigation systems are installed, maintenance requirements will vary with each system. Battery operated controllers require battery replacement at regular intervals. Other controllers require a power supply and meter. Solar powered irrigation controllers may provide a viable alternative that offers reduced maintenance and installation cost.

On major roads, tree canopies should be under-trimmed to provide 13.5 feet of clear trunk height. On neighborhood streets, trees along the road edges should be under-trimmed to provide 8 feet of clear height. Larger vehicles should not be affected by lower neighborhood street tree canopy heights because larger vehicles tend to travel closer to the center of neighborhood streets due to on-street parking. Under-trimming to arterial road standards reduces the visual impact of the trees and may thereby reduce their effectiveness in any traffic calming treatment.

5.3 Treatment Design

Because of the wide variety of environments and problems, it is neither feasible nor desirable to provide standard templates for each treatment. Section 6 provides a layout for each treatment with critical dimensions. It is incumbent on the engineer to fully understand the problem and needs, and to adjust the basic design to meet the situation. To assist in this process, comments on each treatment are discussed below. Each heading includes the Toolbox page number for the treatment.

29-30. Roundabouts

Roundabouts are circular intersections with channelized approaches. Entering traffic must yield to circulating traffic. The design principles of roundabouts and the potential trade-offs are documented in Roundabouts: An Informational Guide, published by the Federal Highway Administration (FHWA). The publication acknowledges there is no one optimal design, and that simply adhering to the principles presented in the guide does not necessarily ensure good design. That is responsibility of the designer.

Design speed

Although roundabouts can be designed for speeds appropriate for traffic calmed areas, the designer must recognize that faster drivers can negotiate roundabouts 5 to 8 mph over the design speed. Recommended design speeds are listed below.

Roadway Classification	Design Speed
Local	12 – 15 mph
Collector	15 – 18 mph

When pedestrians are likely to use the roundabout, entry and exit design speeds should be about the same. Careful attention must be paid to the deflection for speed control along the through leg of the T.

Design Vehicle

Before designing a roundabout the designer needs to confirm the design vehicle for each maneuver. Often a roundabout can be designed using different design vehicle for different movements in order to produce the best overall design. The typical design vehicle for most roundabouts is a fire utility vehicle or

the ladder truck. On smaller roundabouts it is permissible to drive the fire truck over mountable splitter islands. In some locations it is not possible to design a roundabout to control vehicle speeds and permit buses to make left and right turns. Under this circumstance, a truck apron that is only 3 inches high with a tapered curb can be used. This is lower than the preferred design, but the lower height reduces the impact on bus passengers as the bus rides up onto the truck apron and down again. If the required turning movements cannot be accommodated, an intersection table, as discussed on page 29, could be used instead of a roundabout.

Splitter Islands

Splitter island curbs can be reduced to four inches to allow the large emergency vehicles to drive over the islands. The Keep Right sign must also be deleted on mountable splitter islands. This limits the ability of drivers to detect the splitter island, especially at night. Lighting is very important. Limited right-of-way may require the occasional use of painted islands, rather than raised islands. These islands do not provide the same physical protection for pedestrians the six-inch curbs provide and should be used sparingly.

Pedestrian Crossings

The safest time for a pedestrian to cross the street in a roundabout is between stopped cars. When a vehicle of average length (10 ft to 16 ft) stops at the yield point, the second car typically stops four feet behind it. The most likely area for a gap between the stopped cars is between 14 and 20 feet, between the first and second cars. Locate pedestrian crossings 20 feet back from the roundabout entry point, or as close as 15 feet if necessary to avoid driveway conflicts. The Manual on Uniform Traffic Control Devices (MUTCD) permits crosswalks as narrow as eight feet wide in areas of relatively low pedestrian volume, which may also help eliminate driveway conflicts. If necessary, the driveway can be redesigned and extended through the curb extension or bulb out at the roundabout.

Roundabouts on Hills

No research yet provides any guidance for roundabouts on a grade. Anecdotal information suggests that a 5 to 6 percent grade might be the upper limit. When designing roundabouts on hills, there are several items to consider. First, the grade on the circulating roadway can vary from –4 percent to 2 percent for through movements. A positive grade or no grade can be provided where necessary on the circulating roadway opposite the splitter island. The splitter island(s) on any leg that slopes away from the roundabout must be extended so approaching drivers see the island before they see the roundabout.

Center Island Landscaping

On large roundabouts, a clear zone of 15’ from the edge of the center island to any visual obstruction is recommended. Trees with up to a 4” trunk diameter are recommended for smaller roundabouts to provide visibility for drivers entering the roundabout as well as to provide a visual indication to oncoming drivers that there is an obstruction ahead.

Manhole Covers

Manhole covers are often located within intersections and may be in line with the curb lines of a roundabout. When they coincide with the

curb line of the central island or the outside curb line of the central island diameter, the exterior diameter can be enlarged or reduced by one or two feet to fully contain the manhole or to totally exclude it from the curb line. On rare occasions it may be necessary to have the manhole cover in the curb line, then the curb should be shaped to create a "pocket" around inside of the manhole.

Signing

The MUTCD, Part 2, Signing, defines the standard YIELD sign and standards for placement. Note that the use of the yield sign and yield marking on roundabouts are not mandated, but that when a YIELD line is used to supplement a YIELD sign, Part 2 provides Guidance suggesting the YIELD line should be located at a point where the road user should yield. The depiction of these standards and Guidance as shown in Figure 3B-26 should not be construed as precise applications of the MUTCD.

Drainage Inlets

Inlets within a standard intersection must often be moved because of conflicts with curb ramps. Curb ramps in a roundabout intersection are typically placed in advance of the right turn radius, allowing inlet placement in the center of the right turn radius.

Small Roundabouts

In narrow residential streets, the addition of raised splitter islands to small roundabouts is not always possible. In these cases, the splitter islands can be painted or raised three inches so larger vehicle can turn over the island. Keep Right signs are unnecessary and only one Yield sign per approach is used in combination with the central island one-way sign. A small tree in the center is desirable to provide increased visibility on the small roundabout.

32. Modified Tee Intersection

There are several techniques for modifying the priority of Tee intersections. The standard treatment is shown in the Toolbox. An alternate design is to permit the through movement farthest from the terminating leg to be a straight through movement with the reverse through movement diverted to their right if this layout better suits the problem being addressed.

33. Intersection Table

An intersection table allows all movements by all vehicles, an advantage over some roundabouts. To ensure vehicles stay within the intersection area bollards or other barriers must be placed around the right turn radii. The intersection table is also widened to encompass the pedestrian crosswalks so pedestrians do not have to step down and up at the curb lines.

34. Modified Intersection/realignment

At many intersections streets do not intersect at 90 degrees, radii are large, streets are offset from another street and other streets intersect nearby. The resulting variable angle and large, open expanses of asphalt often create unpredictable or erratic vehicle movements. Redesigning these intersections to more conventional geometry, in which streets intersect at or close to 90 degrees with smaller radii and have improved separation between various streets, can take many forms. The simplest method is to separate each intersection as much as possible, then determine the necessary, standard vehicle

movements. Any space not required by vehicles for standard movements is converted to landscape space. To simplify vehicle conflicts, some vehicle movements may need to be blocked with medians and islands. These types of intersection redesigns often create an opportunity to improve pedestrian crossings by providing curb extensions and short medians.

35-36. Radii Reduction, Curb Extensions, and Bulb outs

Some intersections have large radii that permit higher than desirable turning speeds. In these cases reducing the turn radii and extending the curb into the street to create a curb extension will shorten the pedestrian crossing distance and turning speed of vehicles. It is important to determine the design vehicle requirements when selecting radii for either of the above changes. In some cases the right turn exit radii of a street can be smaller than the entry radii. According to AASHTO, it is permissible to require large vehicles to turn across the centerline of the street they are entering.

Drainage must be addressed because bulb outs can reduce on-street drainage capacity and disrupt gutter flow. On streets with existing curbs and streets where no major drainage improvements are planned, there are two options:

1. The existing gutter flow can be adjusted so the water flows along the new curb line. This may require adjusting the length and location of the bulb out to accommodate an existing inlet, moving the existing inlet, or installing a new inlet on the upstream side of the bulb out to convey storm runoff to an existing inlet.
2. Leave the gutter in place between the bulb-out and the existing curb line. Install a checkered steel plate between the existing curb for the sidewalk and the new curb for the bulb-out. The bulb out should be designed to invite pedestrians to cross onto the bulb-out to access curb ramps or crosswalks at the checkerplate or over the pipe laid in the gutter. Only checkered plates that are bolted down are to be used to avoid creation of tripping hazards. Landscaping or special treatments should inhibit pedestrians from attempting to cross onto the bulb-out at any other location.

Other Considerations:

- Vertical curbs are to be used unless mountable curbs are necessary to accommodate turning trucks and buses.
- A transition radius as small as 6 feet is acceptable at bulb out connections to existing curbs, but a 15 foot radius is preferred, when possible, to facilitate street sweeping. The larger radius also makes it easier for drivers to park their vehicles. Combine mid-block bulb-outs and crosswalks whenever possible.
- Driveways can be accommodated by locating driveway aprons along the bulb out edges or by shortening the bulb out so it does not encroach on the driveway.
- If a bicycle lane is marked, the bulb out should not encroach into the lane.

Signing and Marking

An edge stripe with raised pavement markers (RPM) is used to define the edge of the travel-

way and/or edge of the street parking. If a bulb-out diverts two travels lanes into one, striping and signing is required in order to channelize vehicles into the inner lane.

37-38. Short Medians at Intersections/ Gateways

Short medians at intersections provide a number of benefits. When designing them it is useful to consider that the turning paths of vehicles turning out of a street is often narrower than the path when making a left or right turn into the street. Therefore, the exit lane can be narrower than the entry lane into the street. Typically, the exit lane can be narrowed to 10 or 11 feet with the entry lane being widened to approximately 14 feet. Use of truck templates is important to confirm the chosen lane widths.

39. Partial Closure

The design of these treatments require careful consideration regarding drainage and street sweeping. They can have square ends which require manual sweeping of the gutters or radii that permit mechanical street sweeping.

40. Median Barrier

A cut-through should be provided in the median for pedestrian and bike crossings. Median barriers can become useful as pedestrian refuges if they are six or more feet wide.

41. Diagonal Closure

It is important to ensure pedestrian and bicycle access across the diagonal closure. Bicycle access can be provided with simple a cut-through of the diagonal diverter. A barrier is sometimes necessary within the diagonal diverter to stop vehicles driving over the treatment. Trees are useful both as a barrier to errant vehicles and to highlight the treatment from a distance.

42. Street Closure

There are many techniques to close streets, from a simple barrier to conversion of a whole block to a park or playground. Treatments with extensive landscaping can change what can be an unattractive barrier to an aesthetic landscaped area. The closure can be extended to the first driveway to maximize landscape area. Bike access and sidewalks through the treatment are essential. In rare cases, a driveway section can be provided through the center of the treatment with frangible posts that the emergency vehicles can break if they absolutely must go through the treatment.

43. Oval Median

Care needs to be taken with drainage when designing these treatments. A low point is created at the intersection of the curb and gutter if the road is widened into the planter strip. Sometimes it is necessary to install a truck apron on the central island sides to allow large vehicles to pass through the treatment.

44. Chicanes

The most important part of chicane design is to ensure that the edge of each chicane island reaches the street centerline. It may be necessary to ban parking within the chicane. Chicanes are most effective where traffic volumes are balanced in each direction. Placement of chicanes will depend on site conditions such as driveway locations.

45. Median with Tree Wells

These treatments control speed by limiting the space between tree wells and the median. The longer the separation between the trees wells and the shorter median, the higher vehicle speeds will be. Trees are very important in these designs to provide good recognition of the treatments. Signing is minimal with only barrier signs and keep right signs being required. The median must be wide enough to deflect drivers a substantial distance from their travel path.

46. Medians on Curves

Typically, medians on curves are to be a minimum of 18 inches wide. In some cases where this is not possible the use of large pavement markers that are typically 8 to 12 inches wide laid at 90 degrees to the travel lane can provide a substantial barrier to drivers who wish to cut across the centerline of the street. It is important to provide openings in the medians at driveways. In some cases, the openings may be spaced such that the median will have to be extended around the curve and along the straight section of the road to provide reasonable visibility of the median.

47. Driveway Link

This treatment is designed to create the illusion that the street has been closed and a park has been created. Construction of the treatment includes a driveway through the treatment that links both sides of the street . The driveway link is a similar to a typical driveway in that it rises above the existing road level, becoming a very long speed table. Two options have been used to construct these treatments. One option is to lay pavers on top of the existing street surface; the other is a full reconstruction. Landscaping essential to limit the apparent width of the road is very important, as the deflection through the driveway may not be large.

48. Angled Slow Points

These treatments can be designed in a variety of ways. Some are useful for on narrow streets and others for use only on wide streets. They can also be used in conjunction with vertical deflection. On wide streets where a two-lane treatment is to be used, it is important to use a raised median in the center to stop drivers taking a relatively straight path through the treatment. On the single lane version, a speed table may be necessary.

49-50. Speeds Humps and Speed Tables

It is important to ensure that ramps and treatment height is not too low or ramp tapers too long. If the rate of change in vertical position is too forgiving drivers will be able to go over these treatments at a fast rate of speed. The ends of speed humps and speed tables are another critical part of the design. When the ends are designed in a forgiving, easy taper, drivers can put one set of wheels in the gutter and go over the speed hump at high speeds, sometimes in excess of 40 mph. Vertical curb to deter this behavior is preferred.

51. Short medians

This treatment is appropriate for wide streets to reduce travel lane width, provide pedestrians with crossing refuge areas and to prevent drivers from passing other vehicles. A series

of medians varying in length are located between driveways. Space between the medians is slightly wider than the driveway to allow motorists room to turn into and out of their driveways. A simple design technique is to locate each driveway, project it to the center of the road, and widen the projection by 3 to 5 feet. The space not required for driveways becomes a median. Medians do not deflect vehicles, so it is important to minimize the lane width to allow a high level of landscaping to visually narrow the street. The City of Encinitas does not landscape medians less then five feet wide.

52. Raised Pedestrian Refuge

This is a short median provided as a refuge island for pedestrians crossing the road. It should have at least 20 feet of raised island on either side of the crosswalk to give pedestrians a sense of security. These refuges can be supplemented with curb extensions to shorten crossing distance. The cut-through in the refuge can be perpendicular to the cross walk or angled at 45 degrees to encourage pedestrians to look for approaching vehicles.

53. Woonerf

This treatment is better used as part of new street construction or the reconstruction of an existing short street. The intent is to provide a very low speed vehicle environment by using a single 10 or 11 foot lane that can be used by service and emergency vehicles, but which discourages high speed by vehicles. There are many design techniques available for this treatment. Parking can be provided between curb extensions.

54. Street Narrowing

Addition of curb and gutter can physically and visually narrow a street, especially if the curb and gutter is brought in from the existing edge of pavement. The curb and gutter will improve drainage, stop damage to the planter strip, and force drivers to park on the road pavement instead of the planter strip or sidewalks. During the design of this treatment, it is useful to consider the addition of other traffic claming treatments and curb extensions to help protect parking spaces.

55. Centerlines

Centerlines create certainty. They provide drivers with clear information regarding placement and offset of approaching vehicles. This allows drivers to proceed with certainty and be comfortable traveling at higher speeds. The loss of certainty when the centerline is removed helps to slow drivers, particularly on short streets.

56. Bike Lanes

Bike lanes designate travel space for bicyclists, which increases rider comfort and the predictability of bicyclist movements. This added travel space also makes it feasible for motorists to encroach into the space designated for bicyclists and travel faster through or around traffic calming treatments. Limiting bike lanes to streets with more than 1,500 vehicles per day prevents this adverse impact in residential areas. There are generally few conflicts between bicyclists and vehicles in low-speed, low-volume residential areas.

In places where bike lanes are provided the designer must be aware that motorists will

drive over painted lines and adjust the design accordingly. One technique is to move curb extensions or islands between the bike lanes and the treatment. Care must be taken to ensure the design does not set up potential conflicts between pedestrians and bicyclists.

57. On Street Parking

On street parking should be encouraged on all residential streets. Parked vehicles can narrow the street to a single lane, forcing drivers to pull into driveways or empty spaces between parked vehicles to let an opposing vehicle pass. This reduces the speed of both vehicles.

6.0 Traffic Calming Treatment Design Guidelines

Traffic calming, or the management of traffic within neighborhoods, was originally developed in Holland and Australia in the early 1970's. Although its use is increasing throughout the U.S., there are no national design standards for the design of these treatments or for how to sign and mark them. The design guidelines that follow are a collection of traffic calming treatments based on the latest information using standard engineering design techniques and philosophies. Where possible, signs and markings from the MUTCD are shown in the guidelines. Where necessary, enhancements have been added.

Some of these treatments are based on Design Standards from Australia, which has an almost identical neighborhood environment as the U.S. Other treatments are commonly used in the U.S.

Since there is no optimum design for treatments or any consistency in the environment in which they are to be used, these guidelines are intended to serve only as a guide to indicate the basic geometry and sign layout for each treatment. The design engineer can use the basic layout and underlying philosophy to help them design each treatment to suit each location in relationship with adjacent treatments.

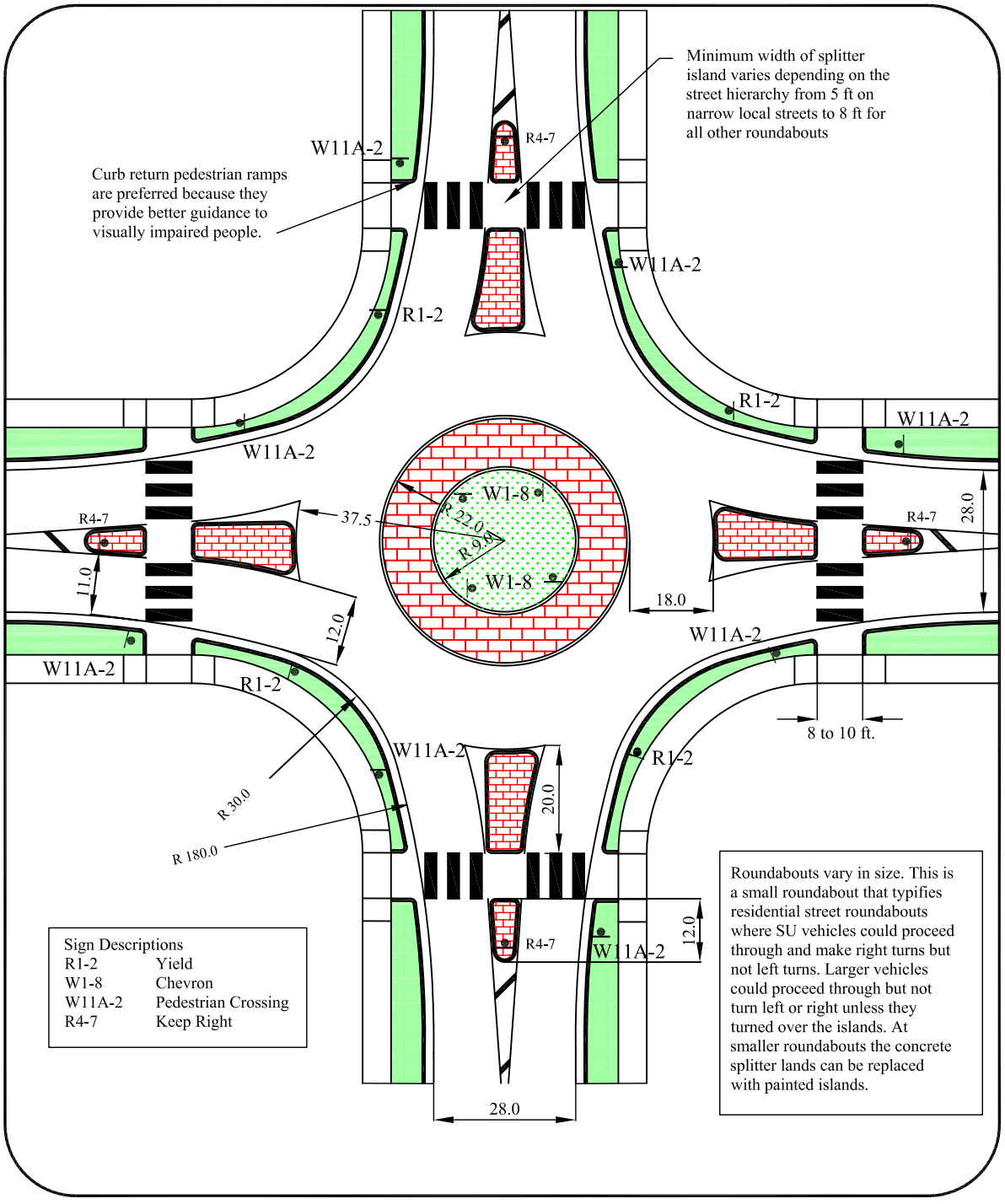
These layouts do not go into detail about drainage, utilities, lighting or landscaping. These items are specific to each situation and vary considerably. More information about the impacts of these and other items is included in section 5.0, Design Considerations.

It will be necessary for lighting to be checked, drainage adjusted or a treatment designed so that it has little to no impact on drainage. Landscaping is an important element of each horizontal deflection treatment and where possible landscape materials should be provided where feasible to enhance both the visibility and appearance of each treatment.

When designing each treatment it is necessary to confirm the design vehicle/s, each movement for design vehicle/s. Often different design vehicles can be specified for different movements. Appropriate design speeds should be selected and the speed curves included within these guidelines used to design each treatment.

Figure 4. Cross Reference Guide

Treatment	Toolbox Page #	Design Considerations Page #	Layout Figure #
Roundabout	29-30	65-67	D-1
Traffic Calming Circle	31		D-2
Modified Tee Intersection	32	67	D-3
Intersection Table	33	67	D-4
Modified Intersection/Realignment	34	67	D-5
Curb Radius Reduction	35	68	D-6
Curb Extensions/Bulb Outs	36	68	D-6
Short Median at Intersection	37	69	D-7
Gateway Treatment	38	69	D-8
Partial Closure	39	69	D-9,10
Median Barrier	40	69	D-11
Diagonal Closure	41	69	D-12
Street Closure	42	69	D-13
Oval Median	43	69	D-14
Chicane	44	69	D-15
Median with Tree Wells	45	70	D-16
Median on Curve	46	70	D-17
Driveway Link	47	70	D-18
Angled Slow Points	48	70	D-19,20,21
Speed Hump	49	70	D-22
Speed Table	50	70	D-23
Short Medians	51	70	D-24
Raised Pedestrian Refuge	52	71	D-25
Woonerf	53	71	
Narrow Street: Add Curbs	54	71	
Centerlines	55	71	
Bike Lanes	56	71	
On-street Parking	57	72	



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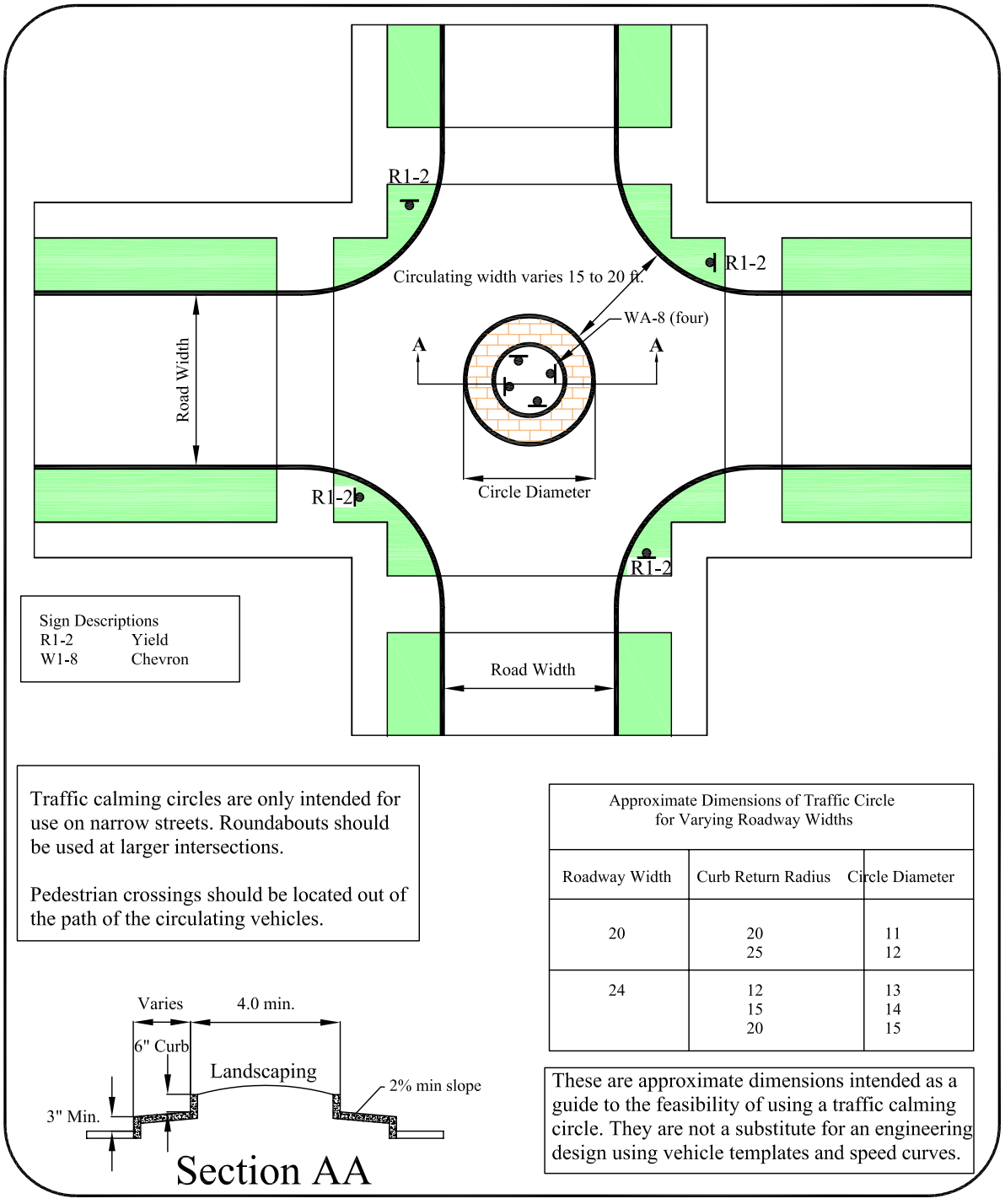
ROUNDABOUT

FIGURE D-1



Sign Descriptions

R1-2	Yield
W1-8	Chevron

Traffic calming circles are only intended for use on narrow streets. Roundabouts should be used at larger intersections.

Pedestrian crossings should be located out of the path of the circulating vehicles.

Approximate Dimensions of Traffic Circle for Varying Roadway Widths

Roadway Width	Curb Return Radius	Circle Diameter
20	20 25	11 12
24	12 15 20	13 14 15

These are approximate dimensions intended as a guide to the feasibility of using a traffic calming circle. They are not a substitute for an engineering design using vehicle templates and speed curves.

Section AA

All dimensions in feet unless otherwise noted.

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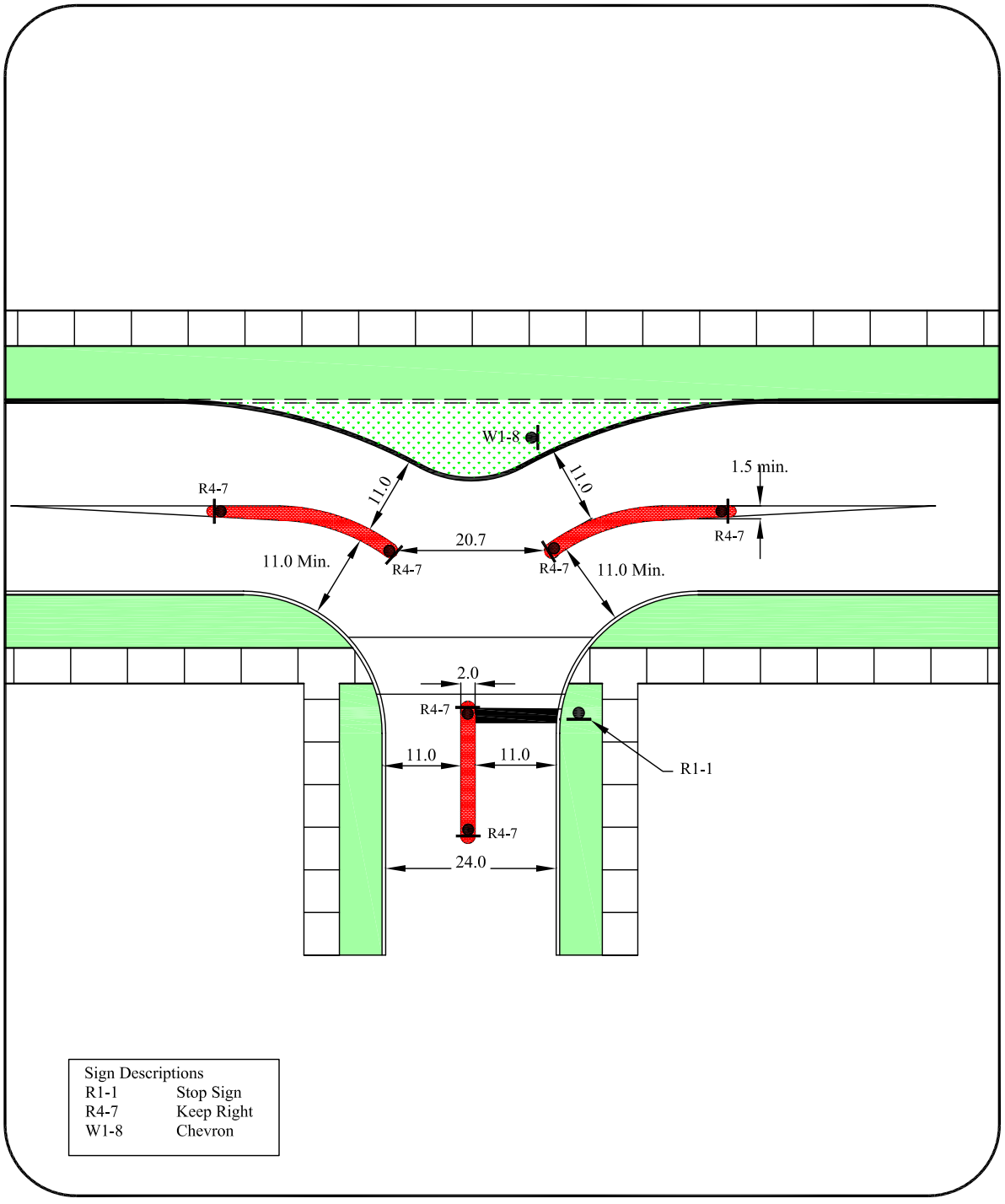
TRAFFIC CIRCLE

FIGURE D-2



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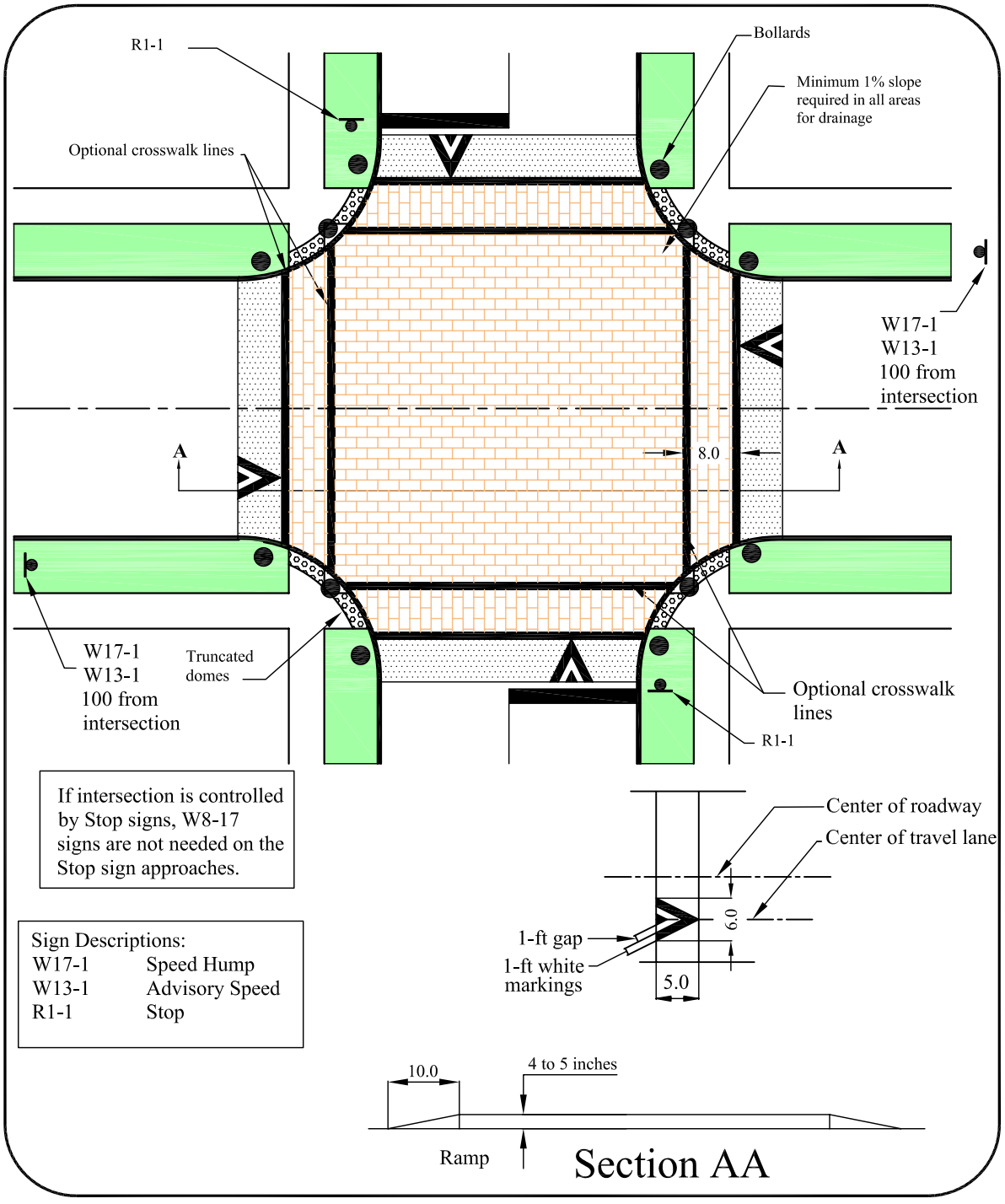
MODIFIED TEE INTERSECTION
FIGURE D-3



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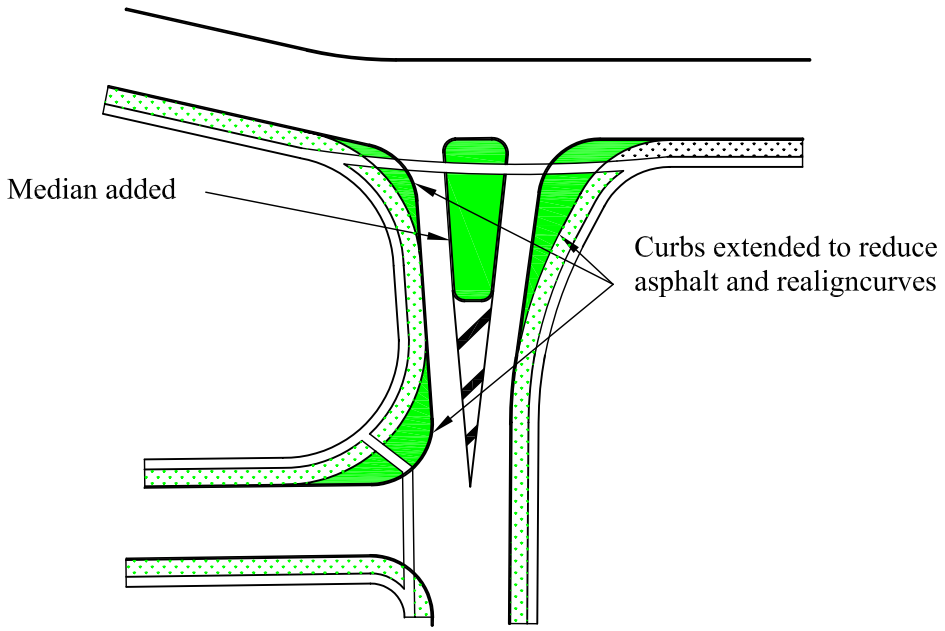
INTERSECTION TABLE

FIGURE D-4



Intersection redesigns can take many forms. This is just one example. Typical techniques include reducing corner radii, realigning streets to as near as possible to 90 degrees, adding medians, moving streets that are offset to the primary intersection away from the primary intersection, adding bulb outs, etc.

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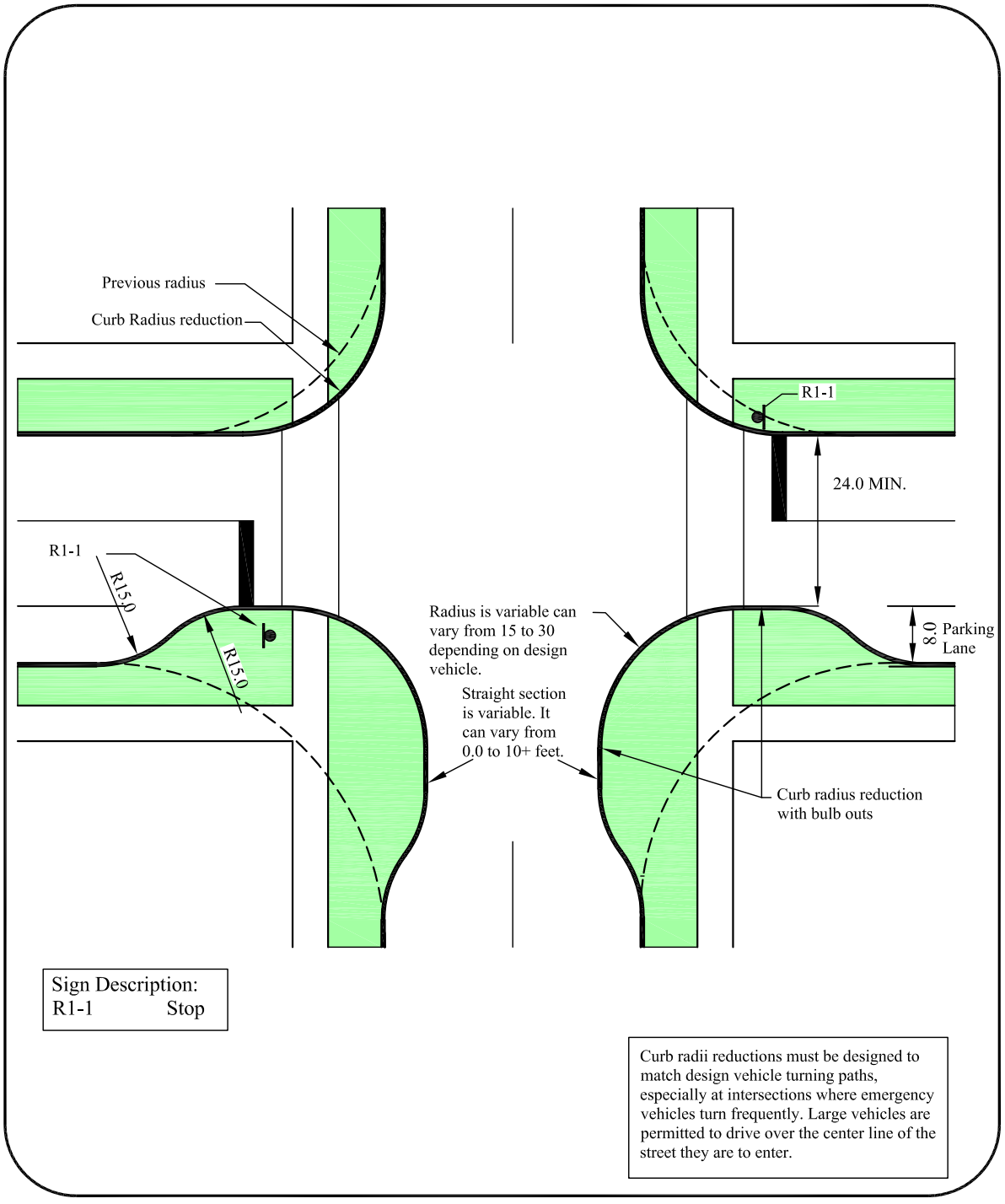
MODIFIED INTERSECTION/REALIGNMENT

FIGURE D-5



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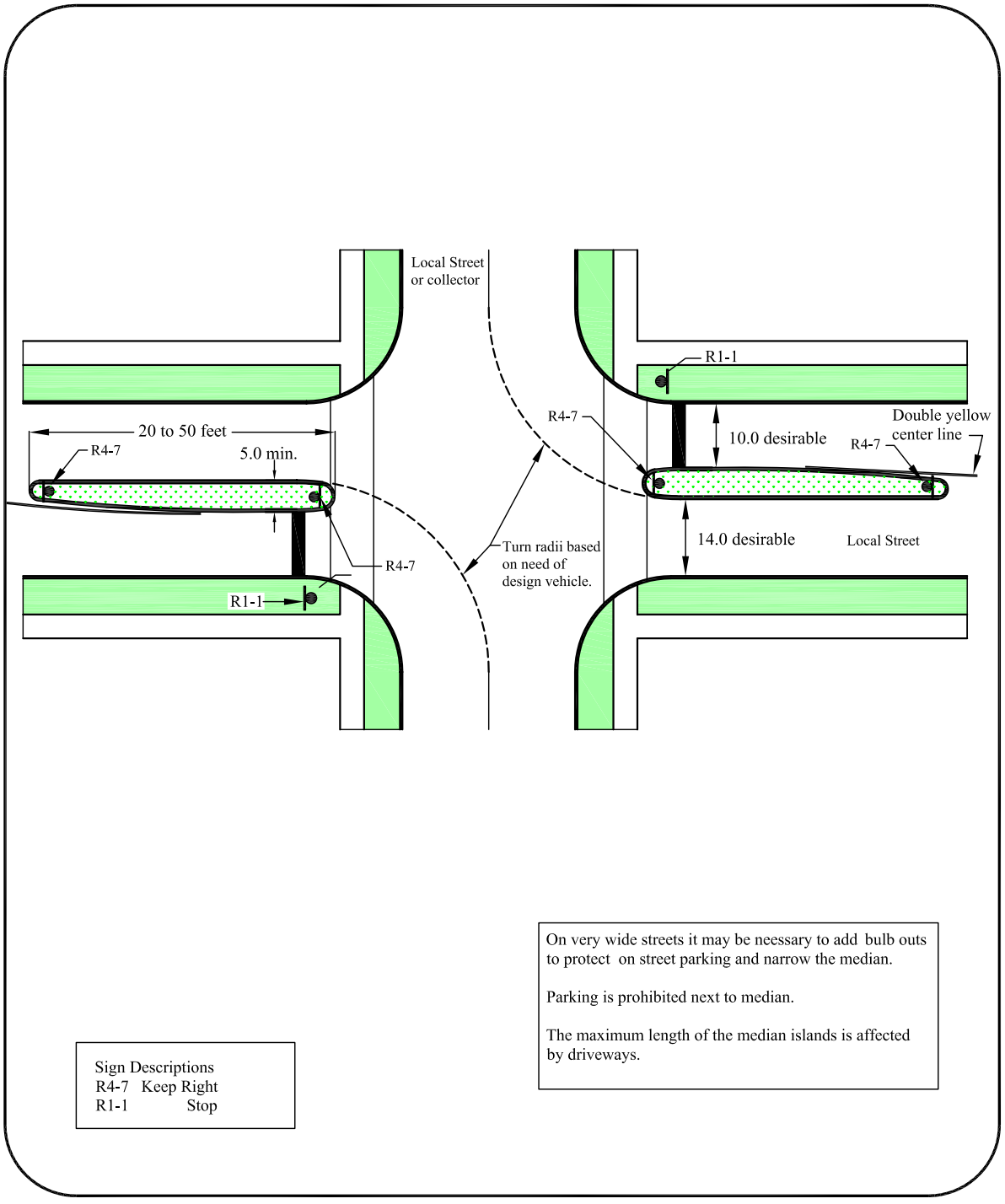
CURB RADIUS REDUCTION, CURB EXTENSIONS

FIGURE D-6



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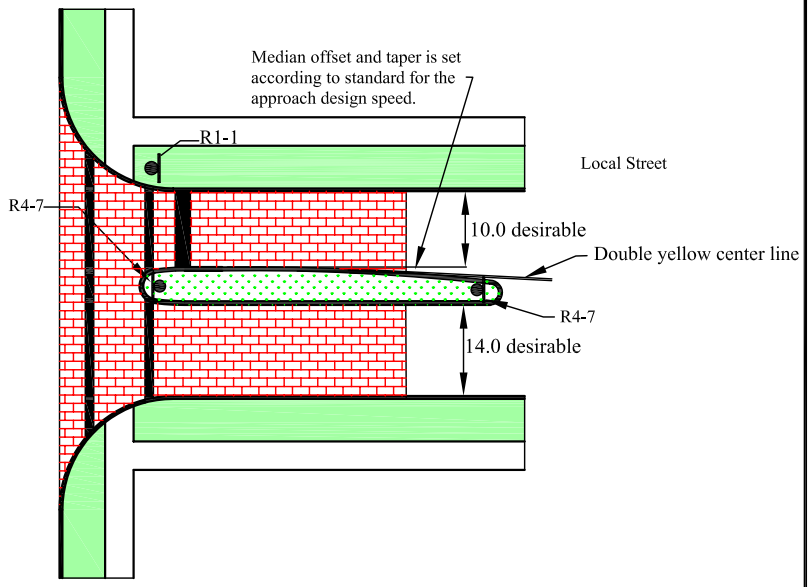
SHORT INTERSECTION MEDIAN

FIGURE D-7



A median with changes in pavement provide a change in the entry environment of a street.

Pavement changes can consist of brick paving, colored asphalt, colored concrete or a textured pavement.

The maximum length of the median islands is affected by driveways.

Parking is not permitted next to median.

Sign Descriptions
R4-7 Keep Right
R1-1 Stop

All dimensions in feet unless otherwise noted.

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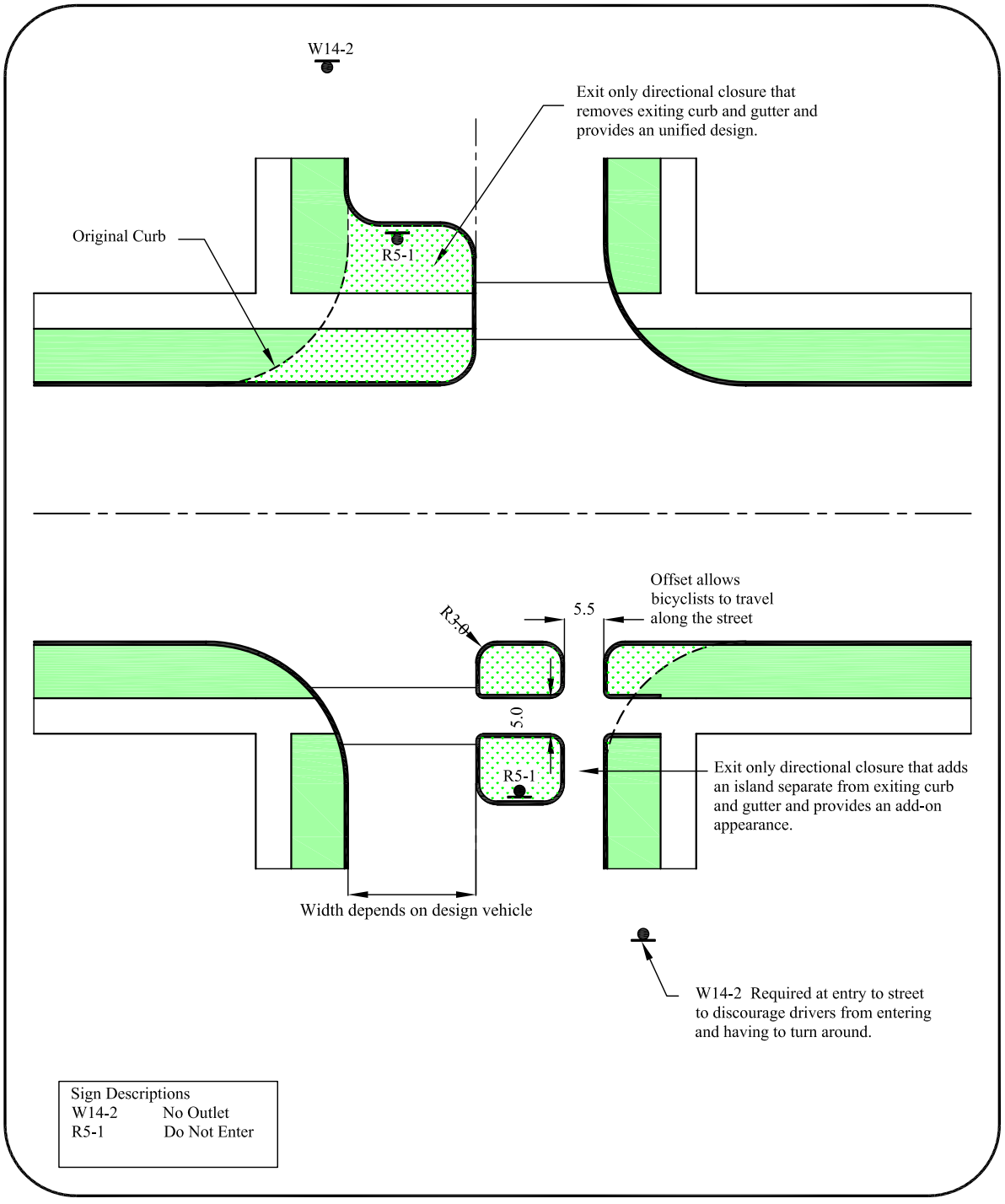
GATEWAY TREATMENT

FIGURE D-8



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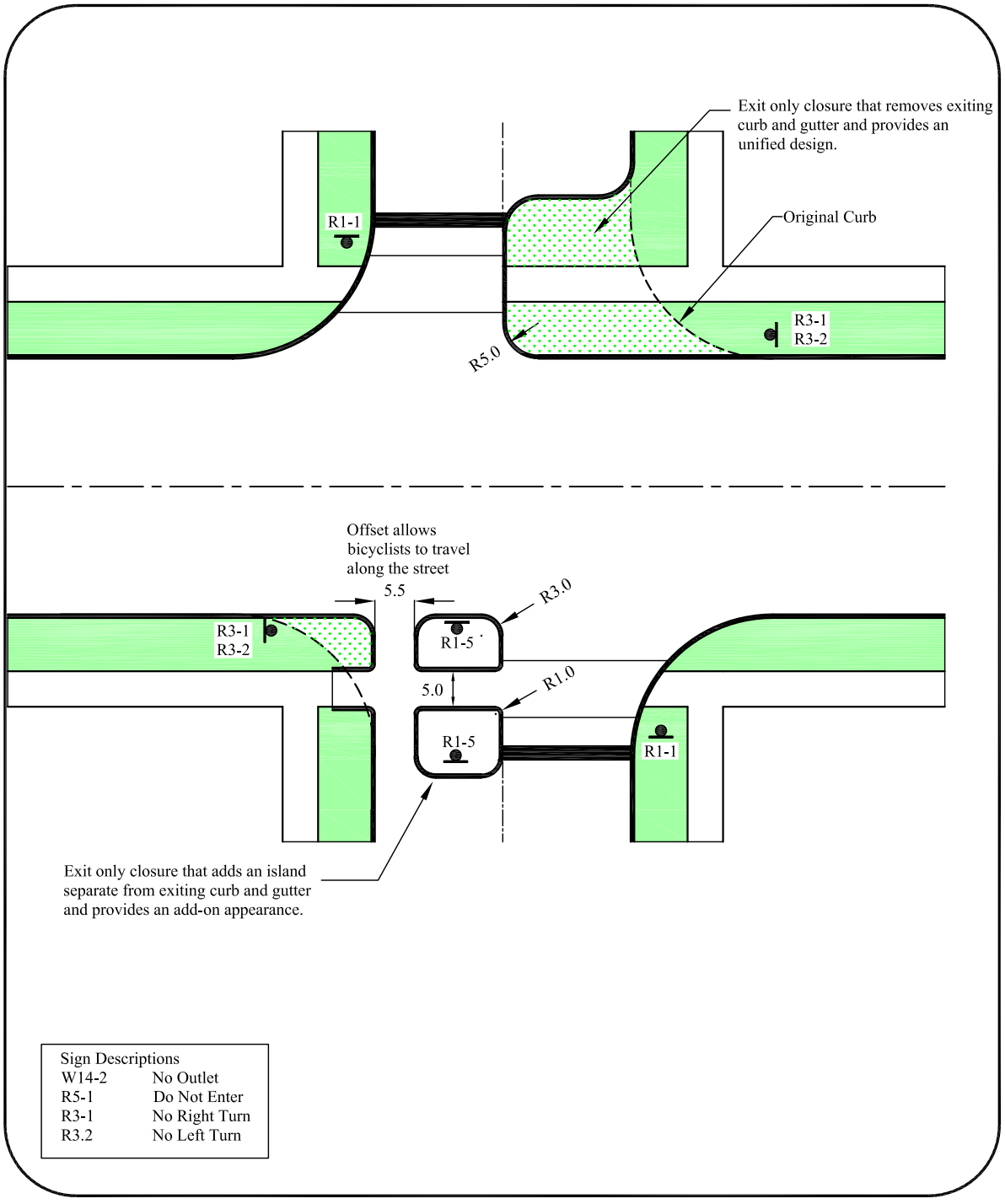
PARTIAL CLOSURE (ENTRANCE ONLY)

FIGURE D-9



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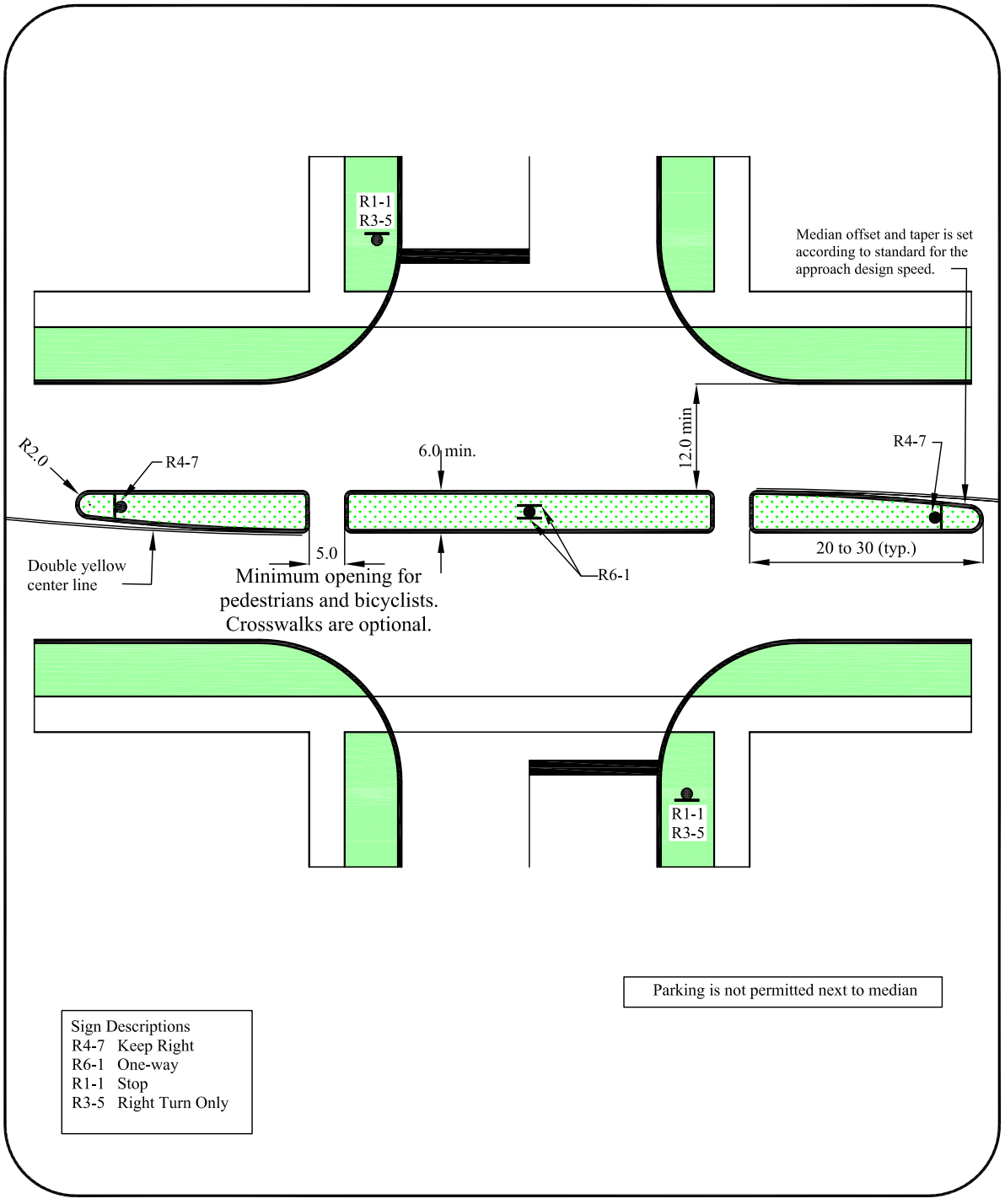
PARTIAL CLOSURE (EXIT ONLY)

FIGURE D-10



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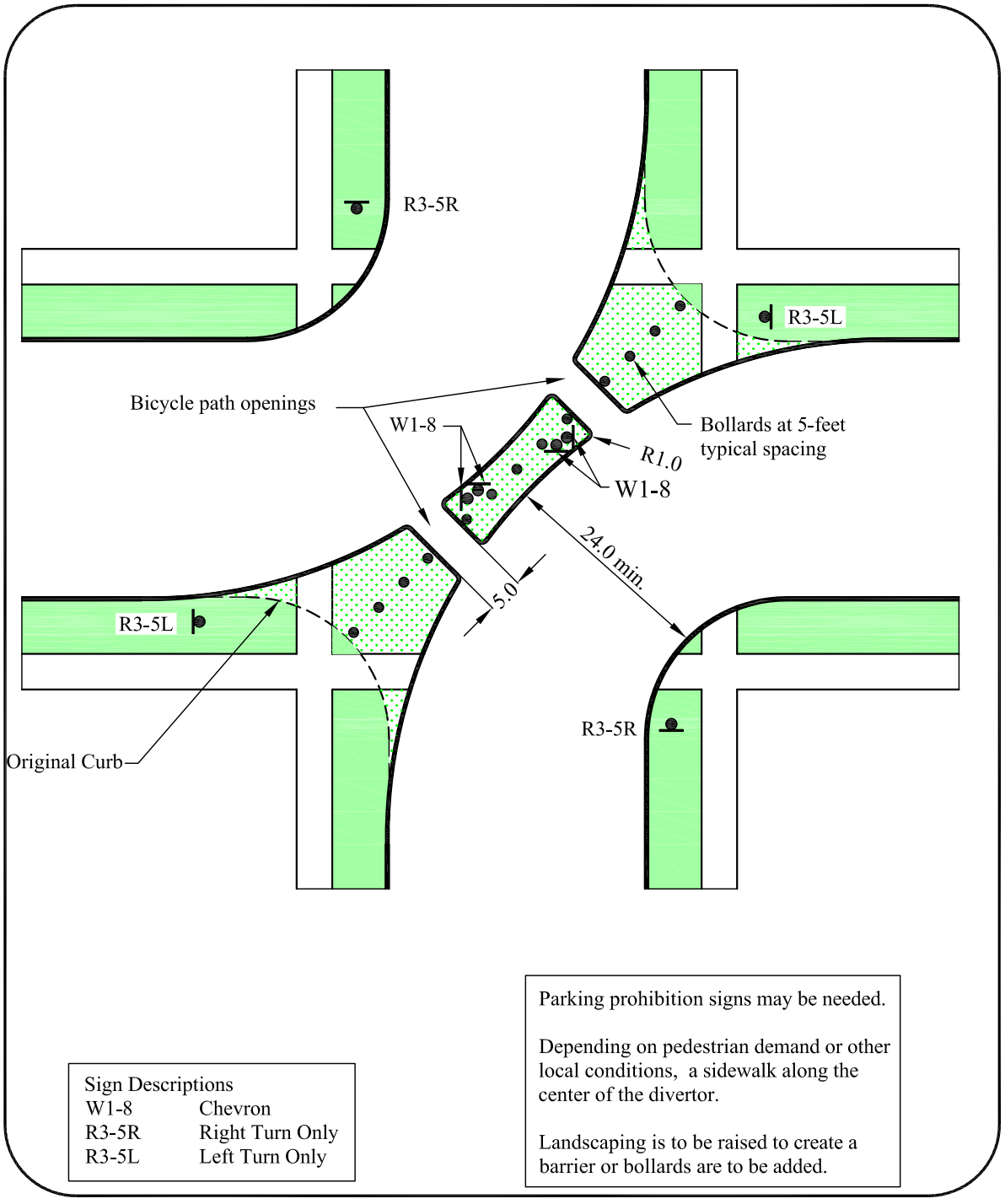
MEDIAN BARRIER

FIGURE D-11



Sign Descriptions	
W1-8	Chevron
R3-5R	Right Turn Only
R3-5L	Left Turn Only

Parking prohibition signs may be needed.

Depending on pedestrian demand or other local conditions, a sidewalk along the center of the divertor.

Landscaping is to be raised to create a barrier or bollards are to be added.

All dimensions in feet unless otherwise noted.

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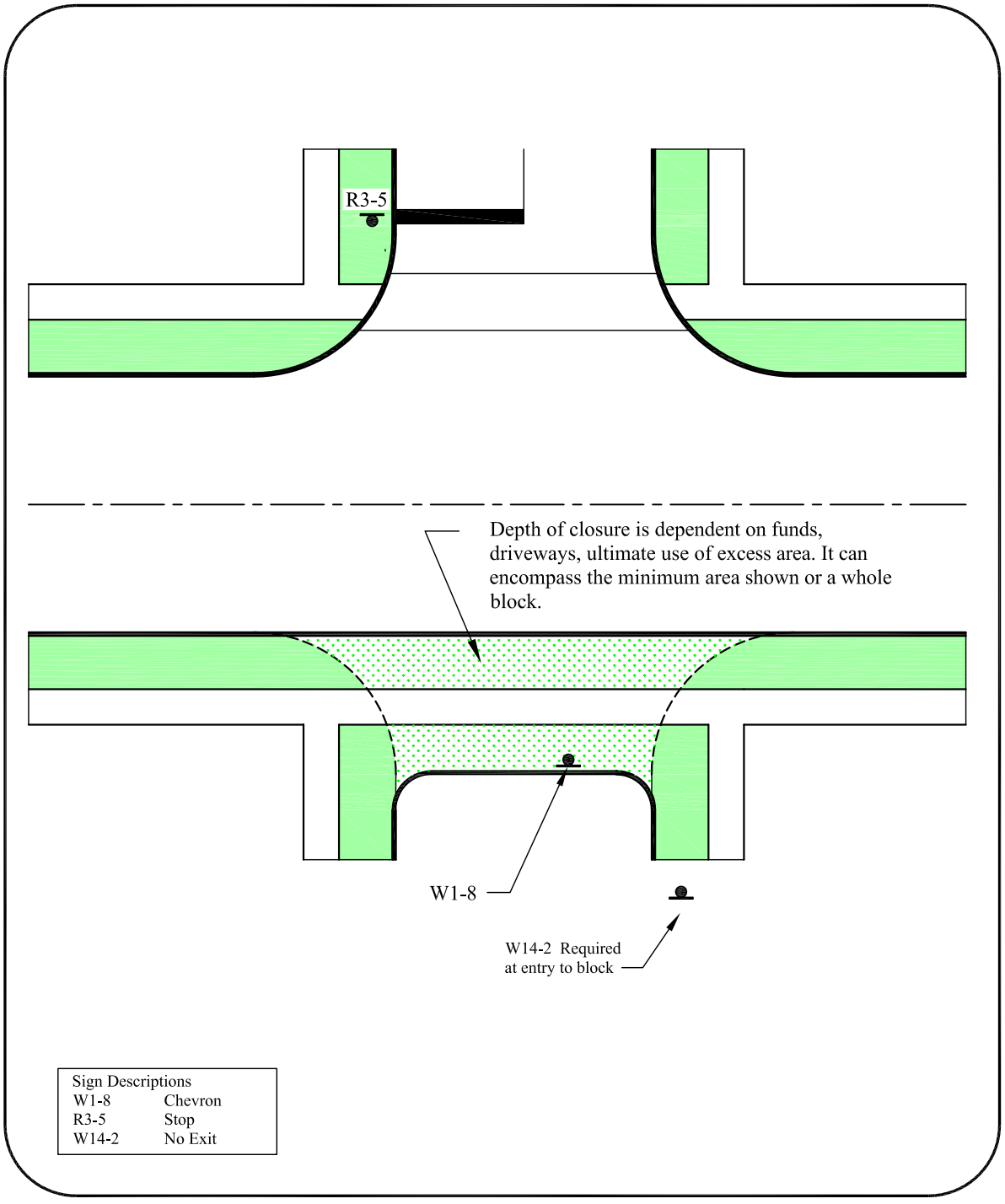
DIAGONAL DIVERTER

FIGURE D-12



All dimensions in feet unless otherwise noted.

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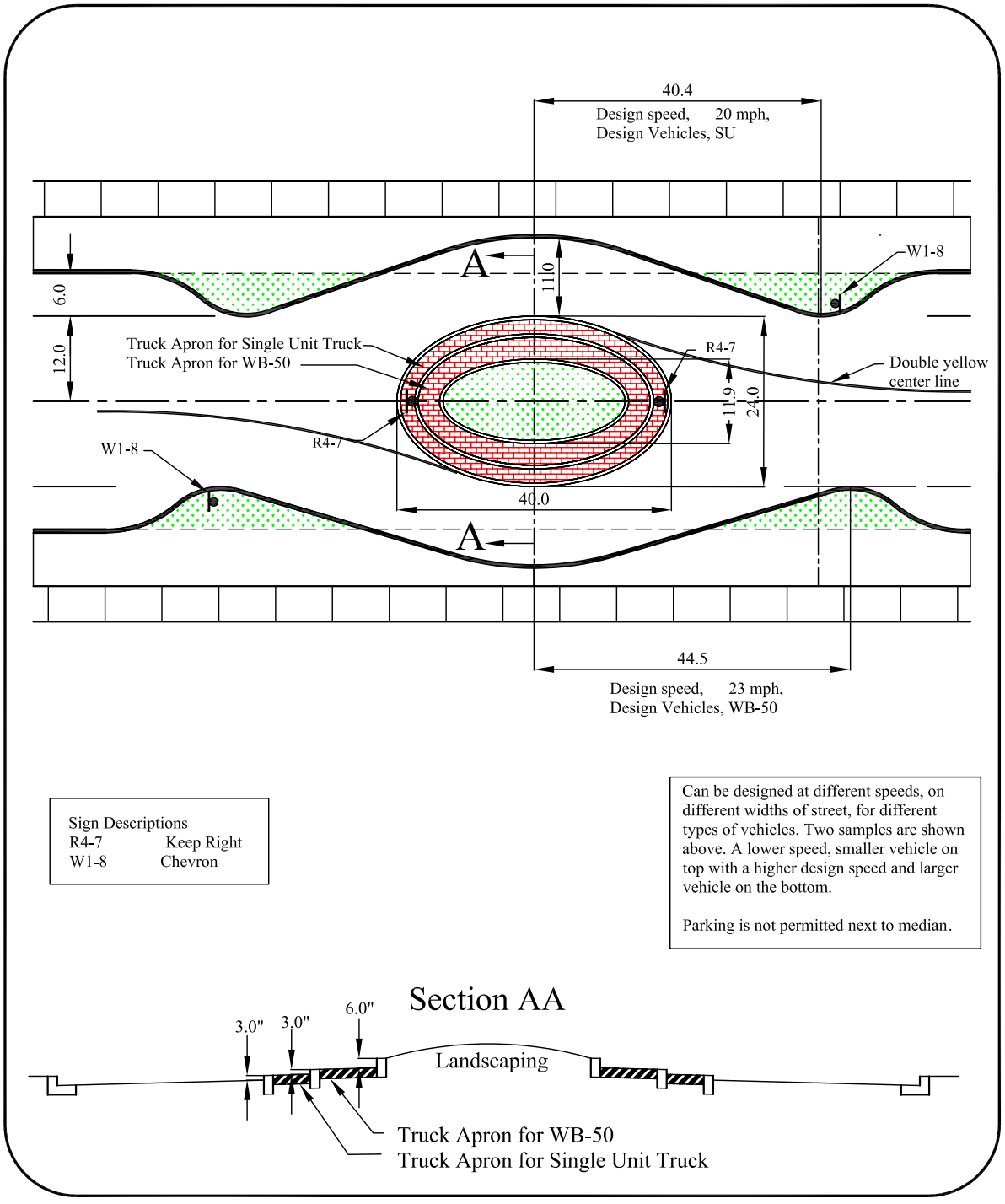
STREET CLOSURE

FIGURE D-13



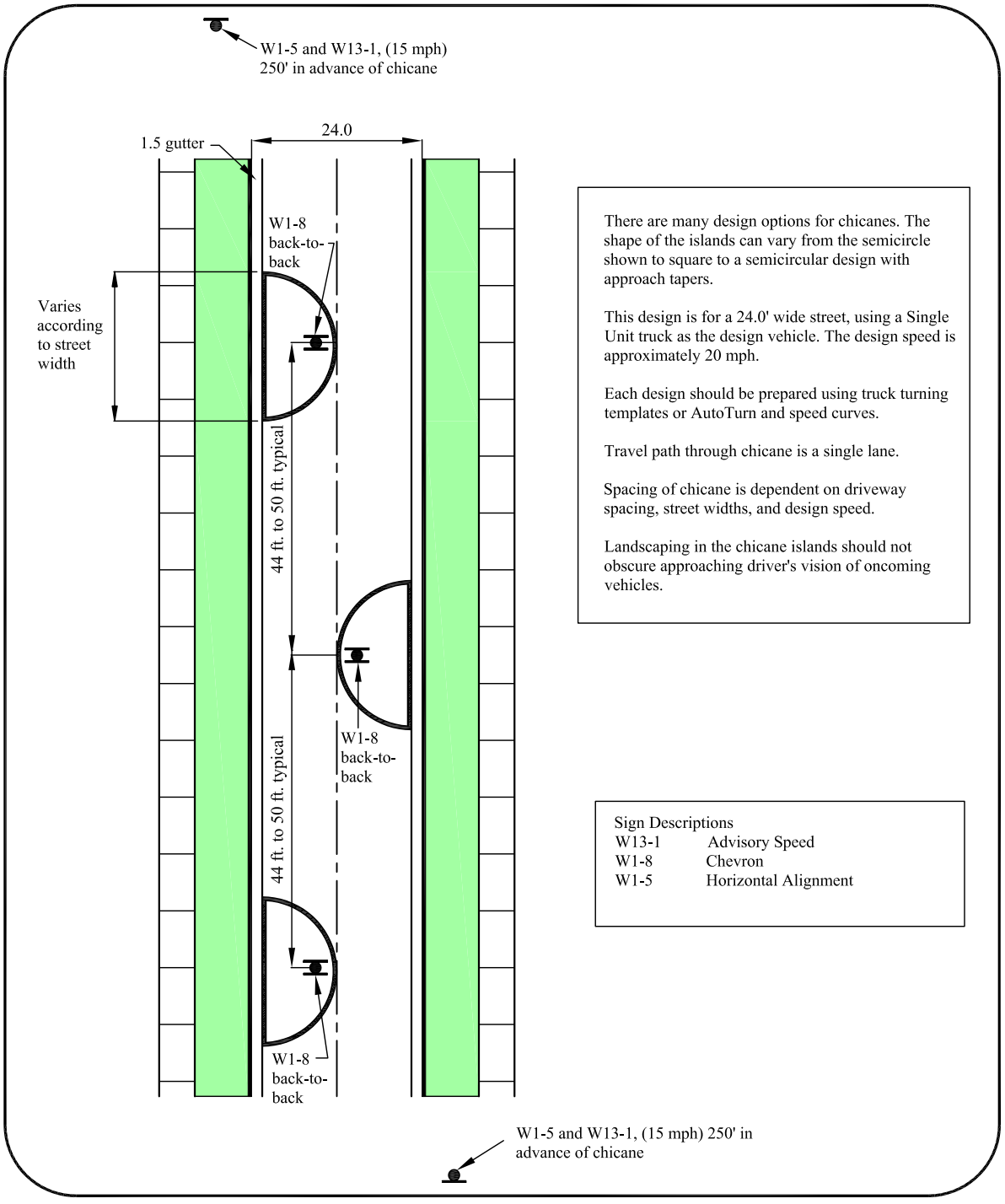
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

OVAL MEDIAN

FIGURE D-14



There are many design options for chicanes. The shape of the islands can vary from the semicircle shown to square to a semicircular design with approach tapers.

This design is for a 24.0' wide street, using a Single Unit truck as the design vehicle. The design speed is approximately 20 mph.

Each design should be prepared using truck turning templates or AutoTurn and speed curves.

Travel path through chicane is a single lane.

Spacing of chicane is dependent on driveway spacing, street widths, and design speed.

Landscaping in the chicane islands should not obscure approaching driver's vision of oncoming vehicles.

Sign Descriptions

W13-1	Advisory Speed
W1-8	Chevron
W1-5	Horizontal Alignment

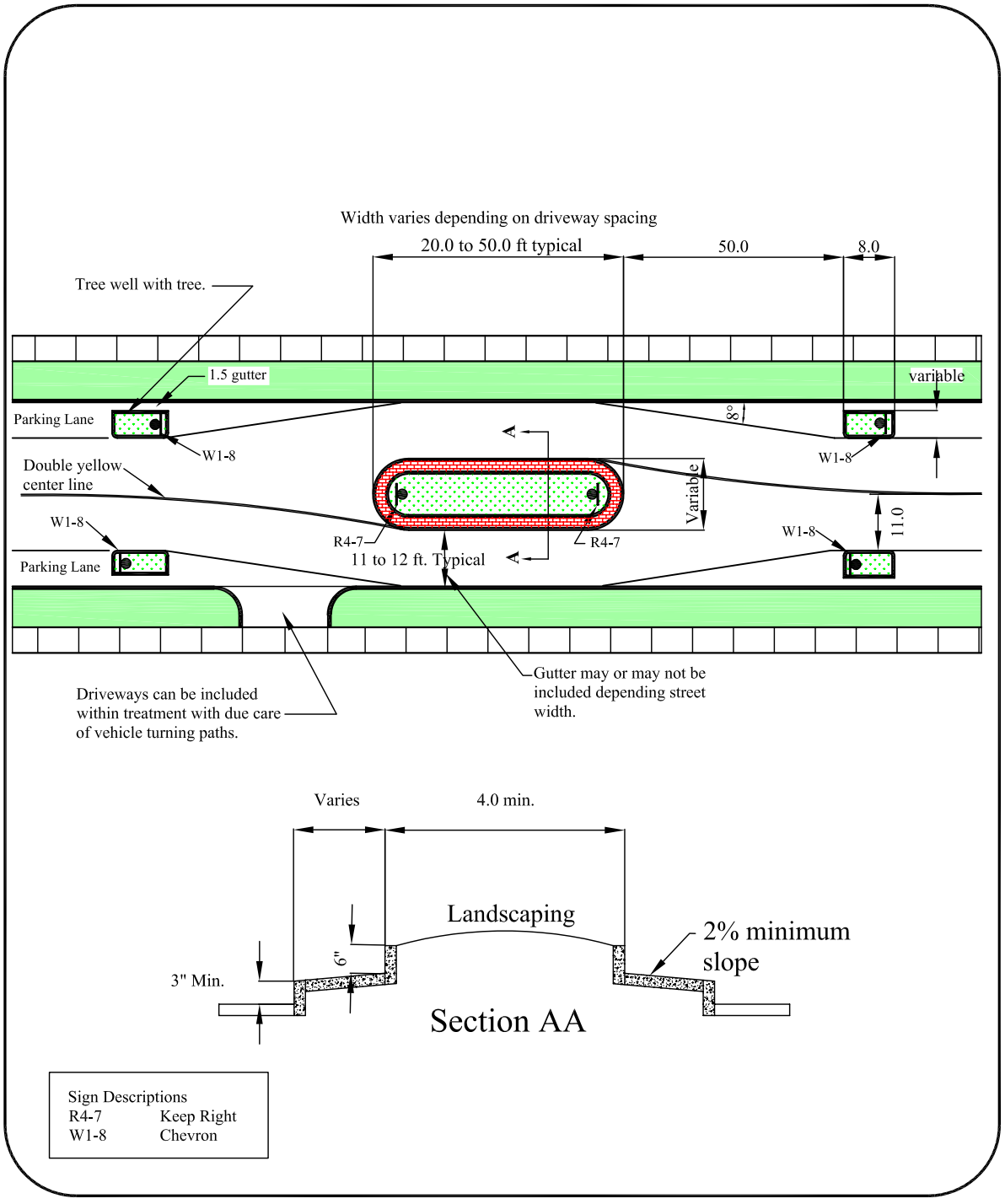
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

CHICANE

FIGURE D-I5



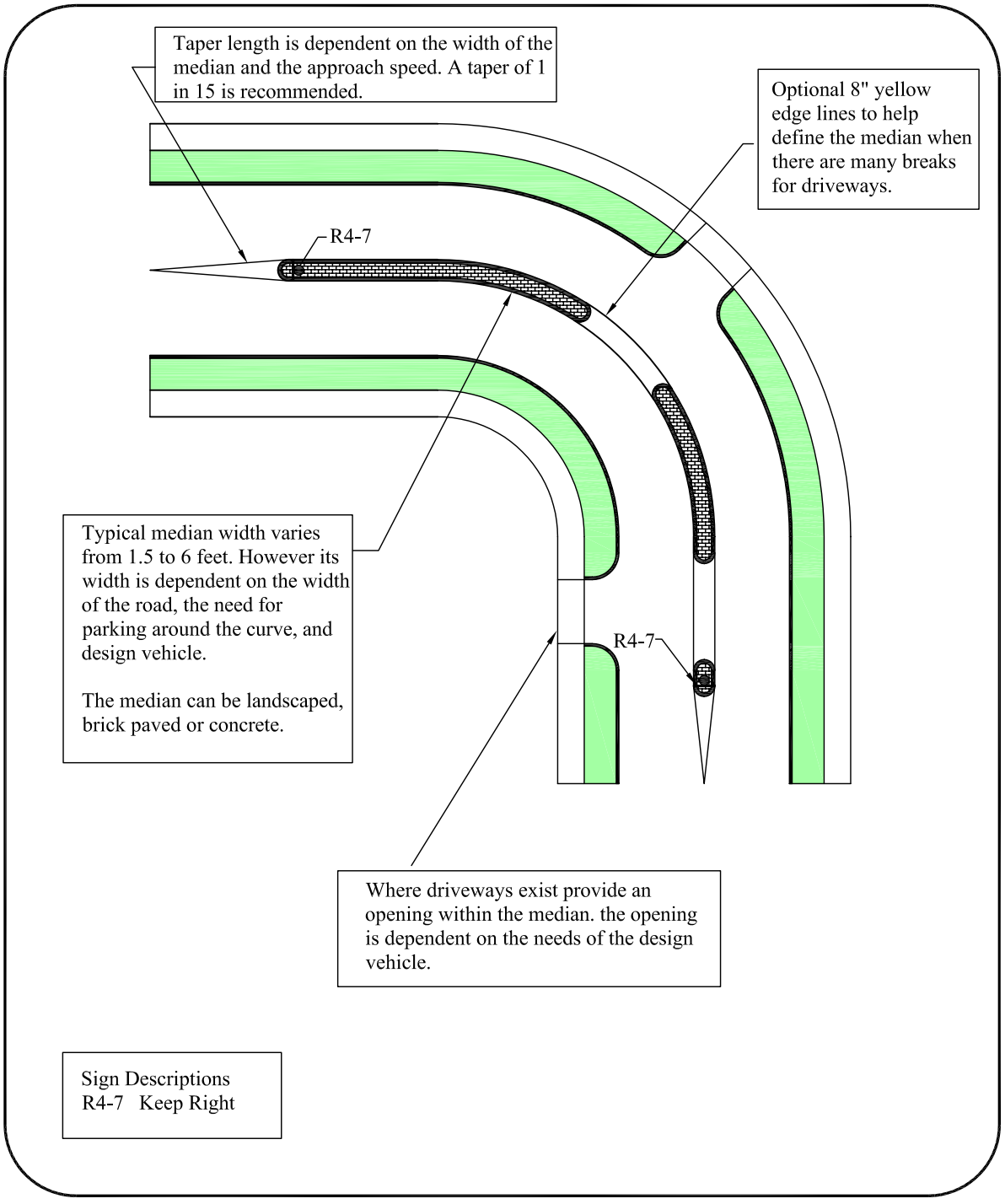
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

SHORT MEDIAN WITH TREE WELLS

FIGURE D-16



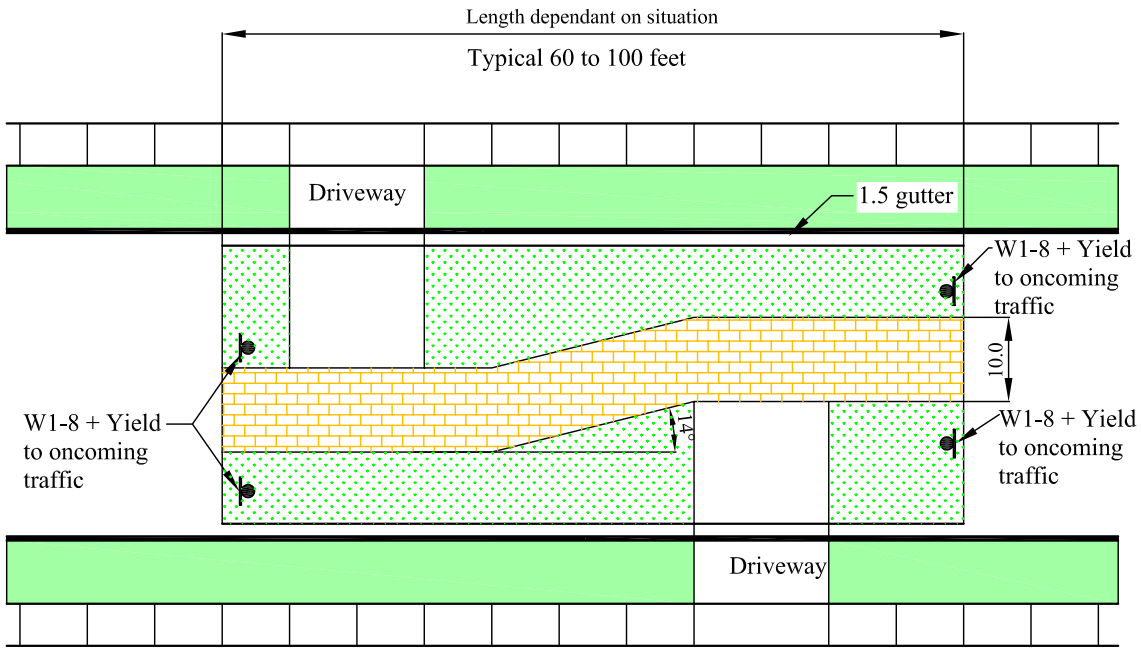
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

MEDIAN ON CURVE

FIGURE D-17



Sign Descriptions	
Extra	Yield to Oncoming traffic
W1-8	Chevron

There are many design options for a Driveway Link. The basic design is to close the street and provide a 10-ft wide driveway through the area. The driveway can be curved, it can be angled or bent as shown. Landscaping is fairly dense to create an appearance of a closed road. The driveway is typically raised with driveway ramps at each end.

Driveways to abutting properties can access this driveway link.

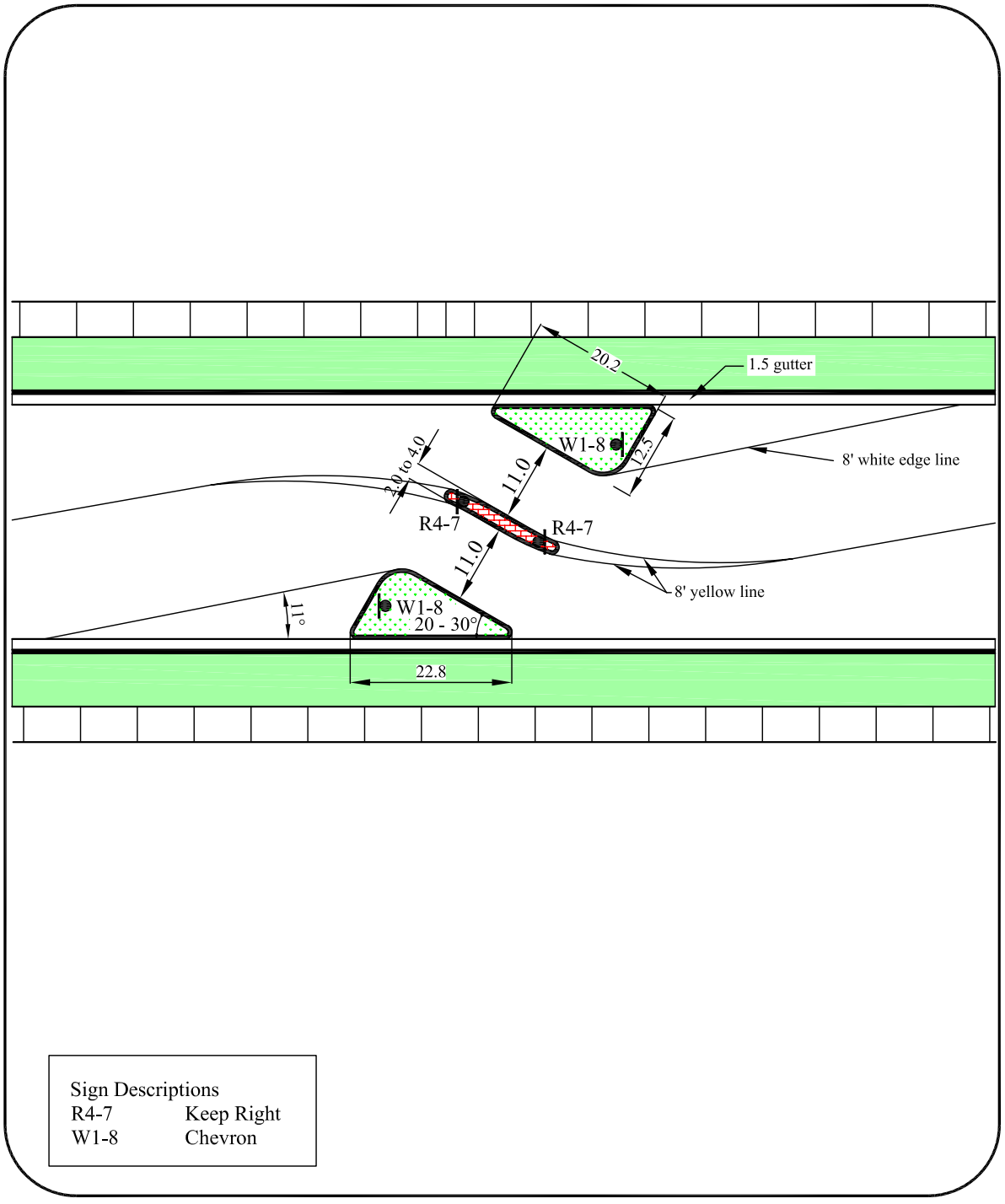
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

DRIVEWAY LINK

FIGURE D-18



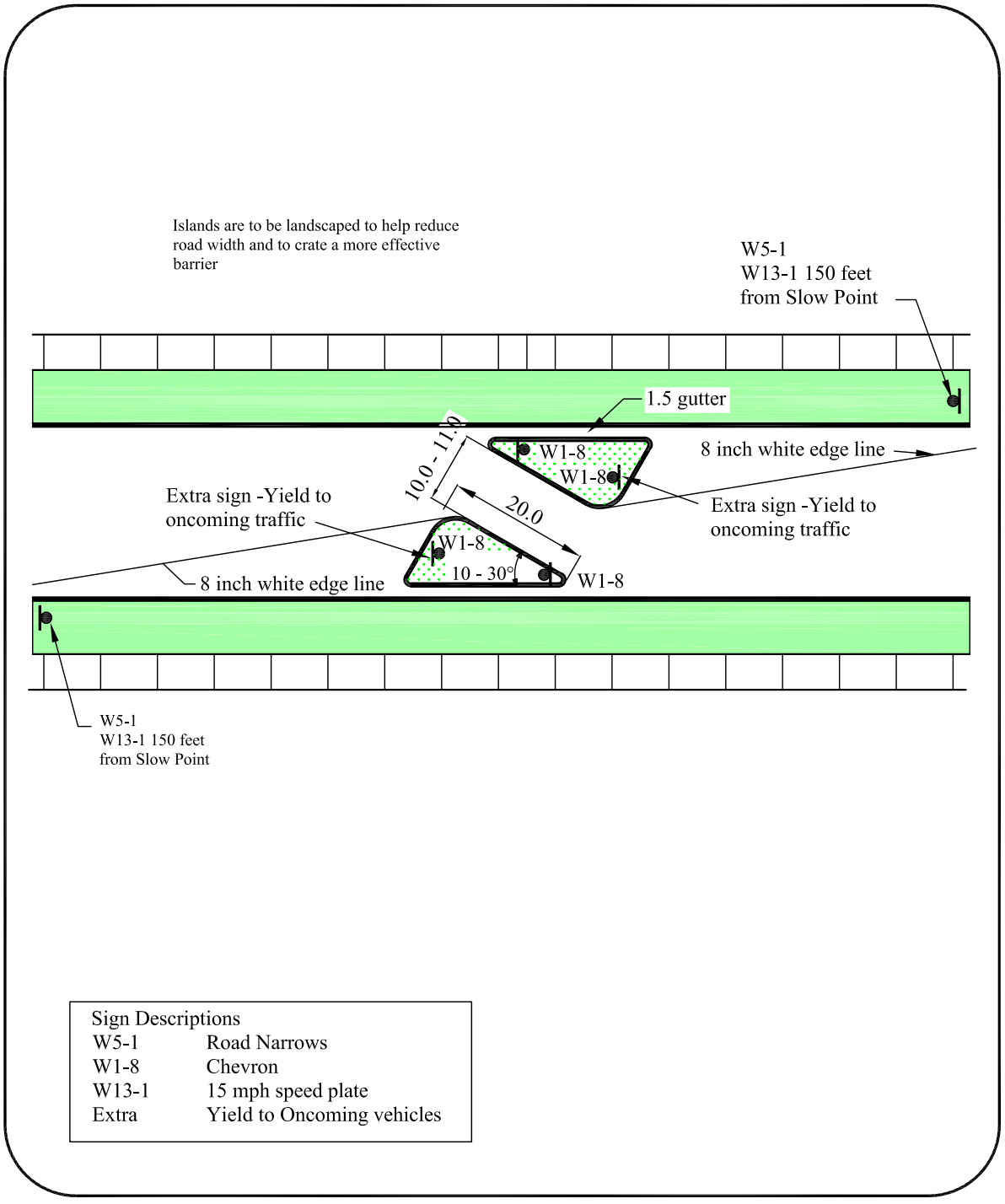
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

TWO LANE ANGLED SLOW POINT WITH MEDIAN

FIGURE D-19



Sign Descriptions	
W5-1	Road Narrows
W1-8	Chevron
W13-1	15 mph speed plate
Extra	Yield to Oncoming vehicles

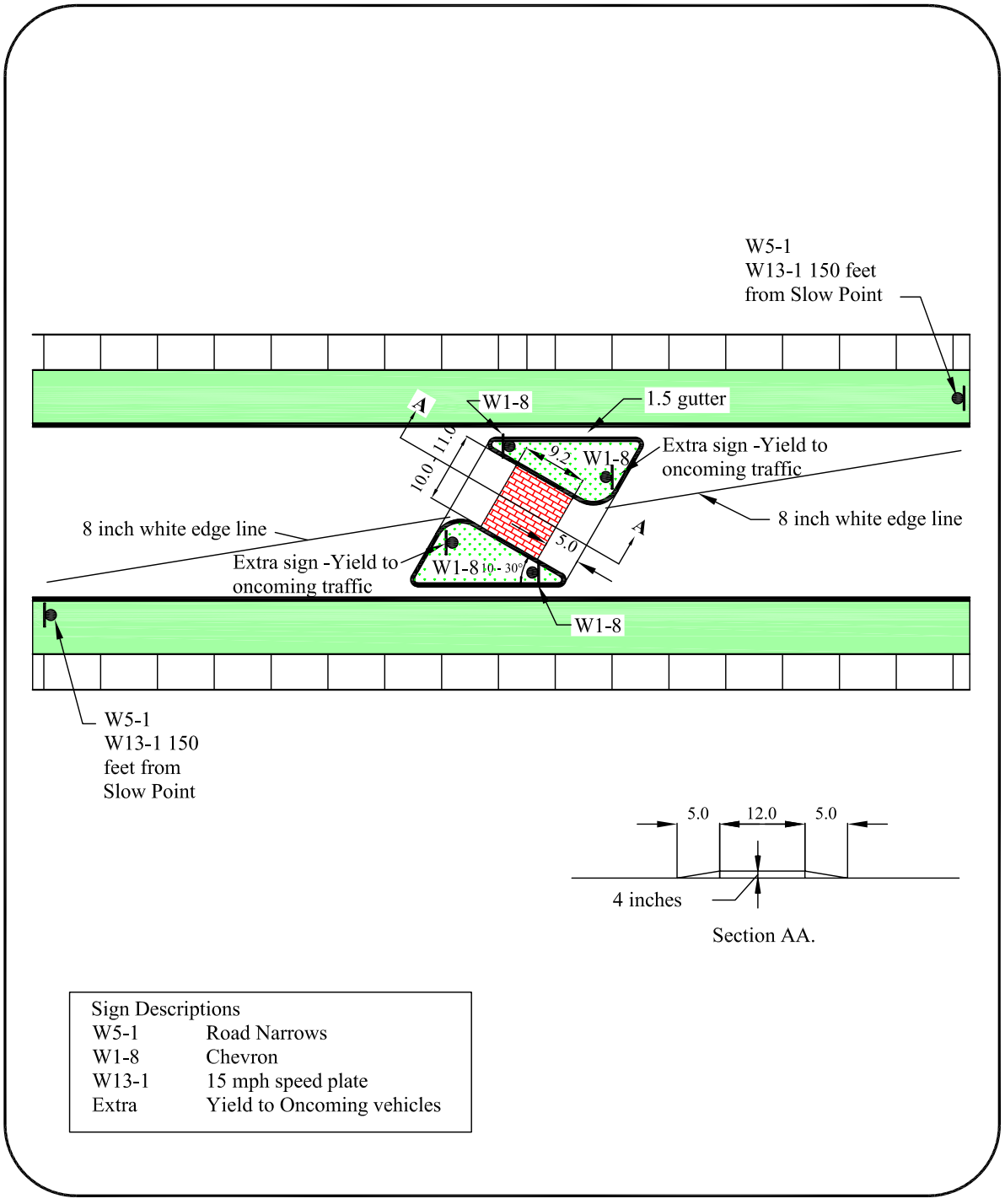
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

ONE LANE ANGLED SLOW POINT

FIGURE D-20



Sign Descriptions	
W5-1	Road Narrows
W1-8	Chevron
W13-1	15 mph speed plate
Extra	Yield to Oncoming vehicles

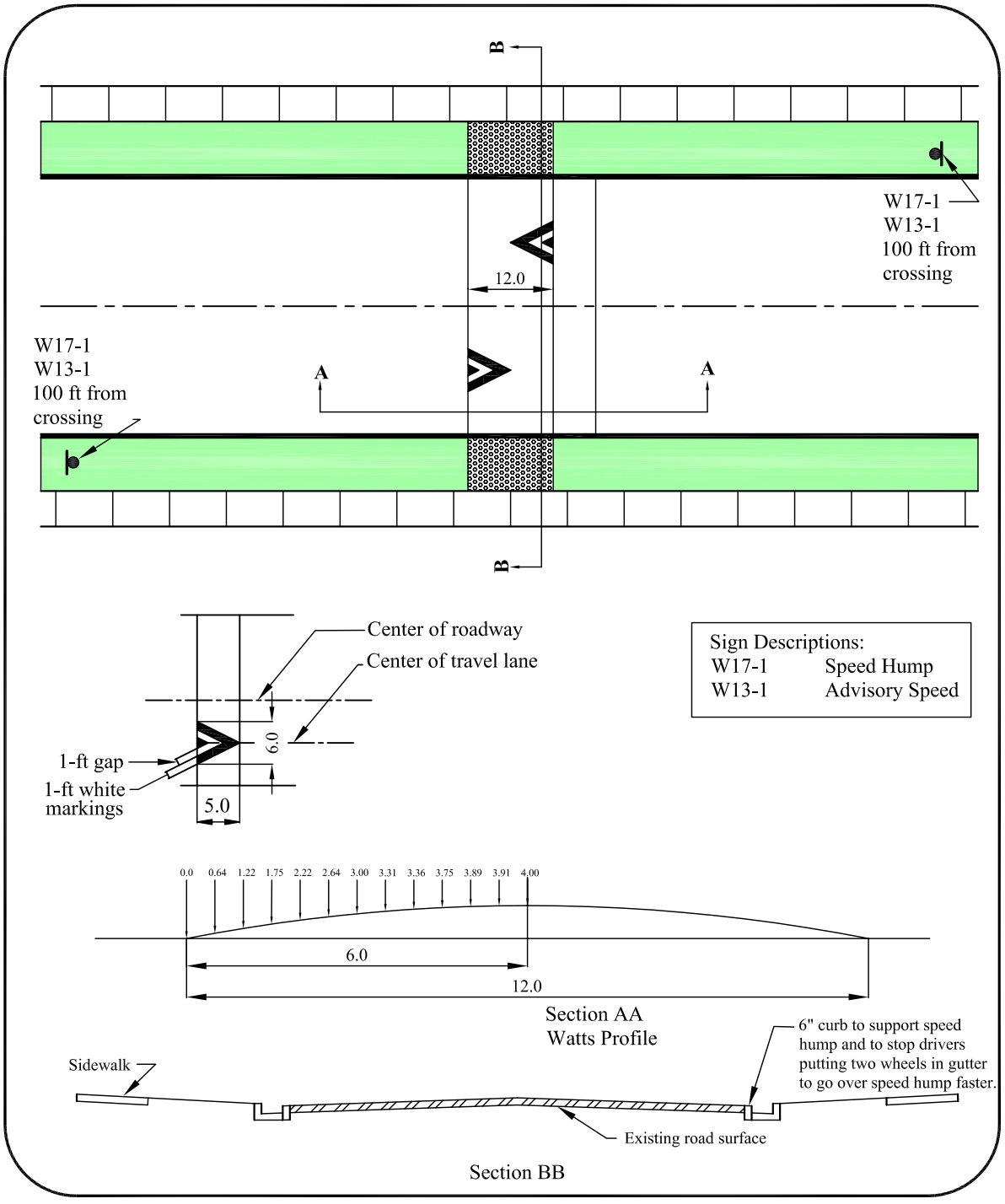
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

ONE LANE ANGLED SLOW POINT WITH SPEED TABLE

FIGURE D-21



All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
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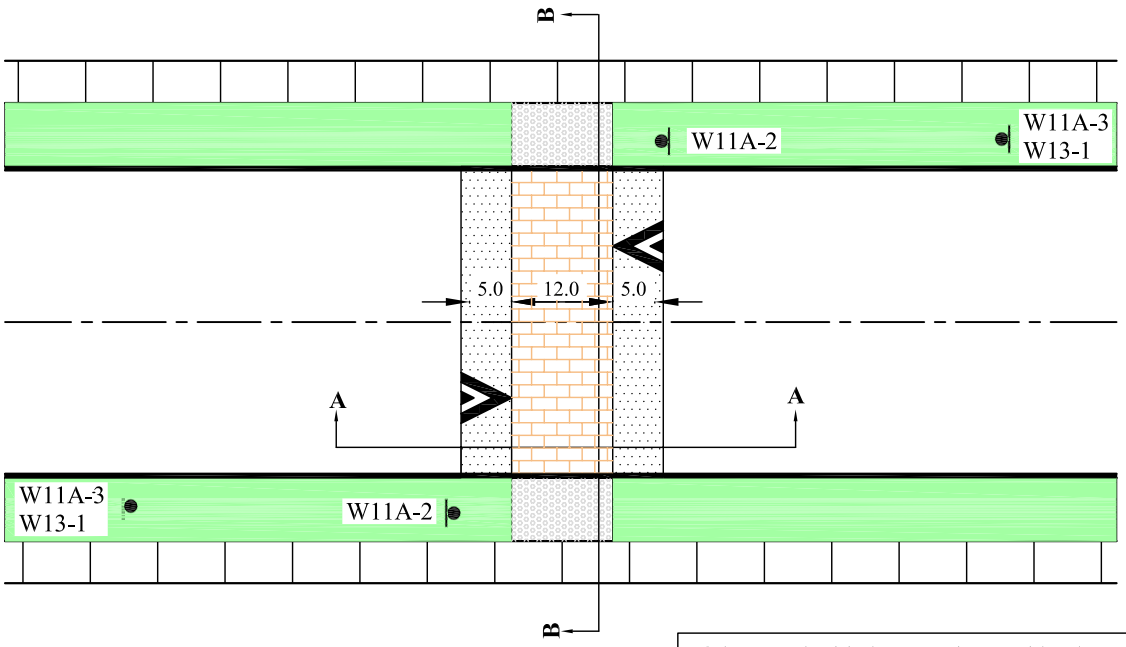
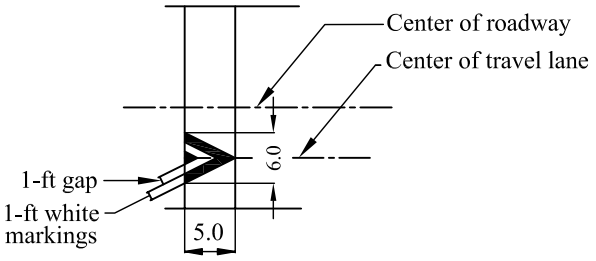
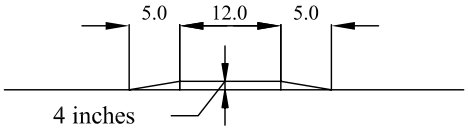
SPEED HUMP

FIGURE D-22

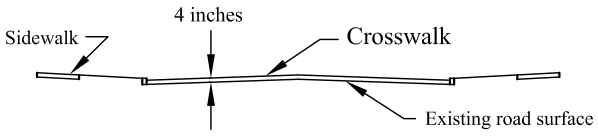




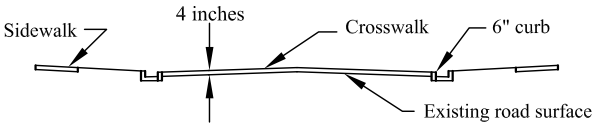
If the speed table is not to be combined with a pedestrian crossing then the crossing signs and tactile surfaces can be deleted. Drainage inlets are required on the uphill side of the raised crosswalks unless bolted down covers are provided between crosswalk and curb. Curb extensions can be added to narrow travel lanes and shorten pedestrian crossing distance.



Section AA.



Section BB with Crosswalk



Section BB when used as a speed table only

Sign Descriptions:

W11A-2	Pedestrian Crossing
W11A-3	Raised Pedestrian Crossing
W13-1	Advisory Speed Plate

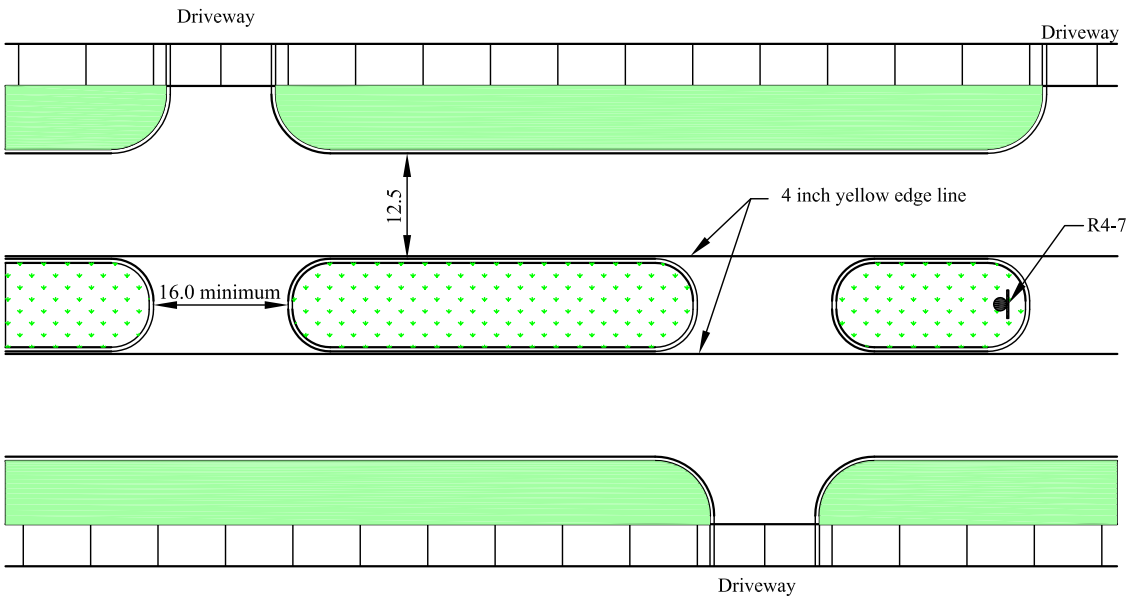
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

SPEED TABLE

FIGURE D-23



This treatment is a continuous median with openings opposite driveways. Each side of each driveway is projected to the center of the street and a minimum 16.0' foot wide opening is created opposite the driveways. Where the openings overlap the median opening increases in length. Where the openings do not overlap a short median is created.

The width of the median depends upon the street width and the need to provide on street parking.

Sign Descriptions
R4-7 Keep Right
Only used at the start of the medians.

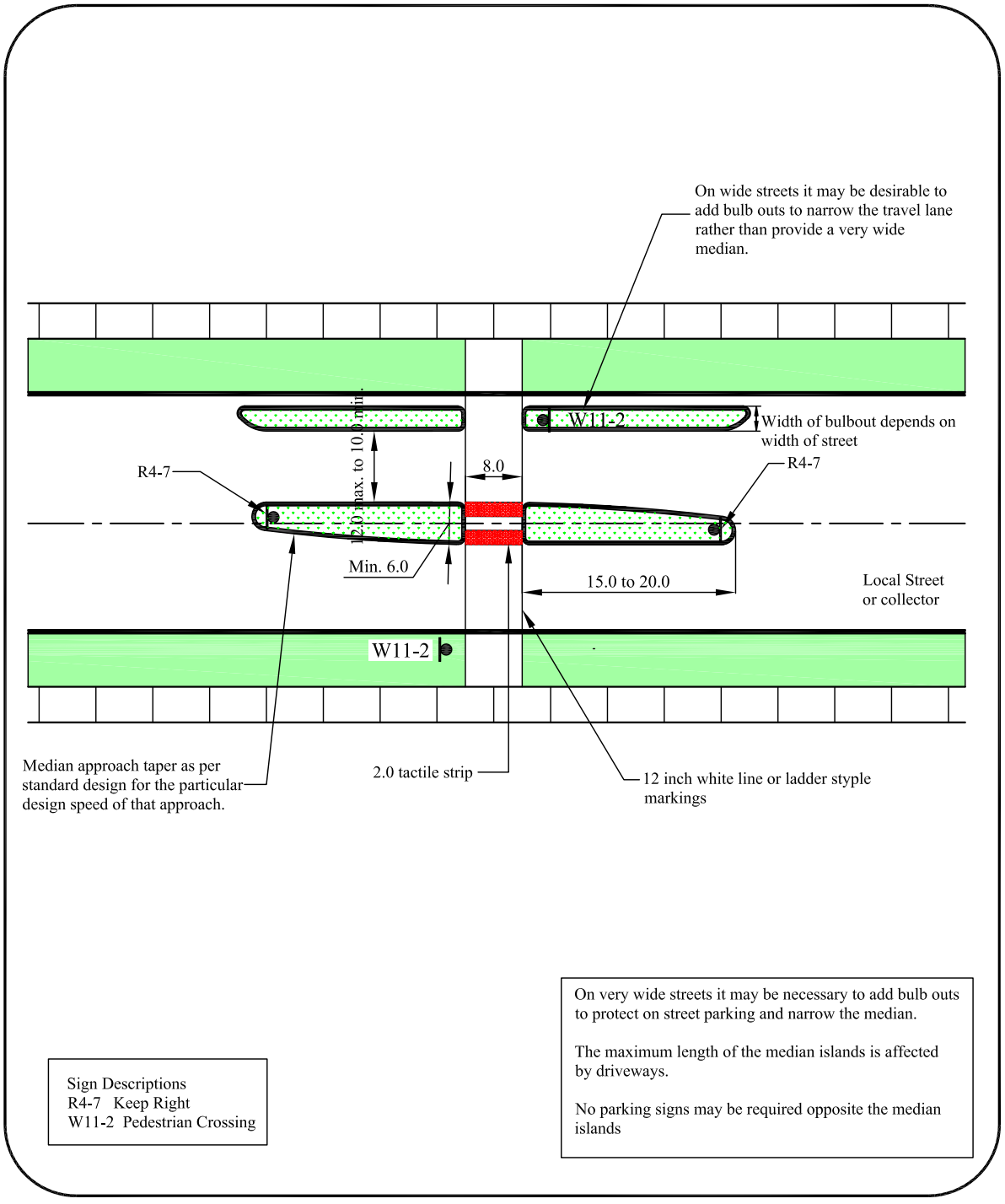
All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

SHORT MEDIANS

FIGURE D-24



All dimensions in feet unless otherwise noted.

NOT TO SCALE

DEPARTMENT OF
ENGINEERING SERVICES

RAISED PEDESTRIAN REFUGE
FIGURE D-25

Appendix

ENDNOTES

1. Roundabouts: An Informational Guide U.S. Department of Transportation, Federal Highway Administration. Page 20, Item 2.1.7. The service life of a roundabout is approximately 25 years, compared with 10 years for a typical signal

2. Roundabouts: An Informational Guide U.S. Department of Transportation, Federal Highway Administration. Page 34, Item 2.2.5. This section discusses the need to compare emergency vehicle delay at a roundabout with that of alternative traffic control measures. The discussion points out that emergency vehicles benefit from the lower vehicle speeds and the elimination of the vehicles that can travel at high speeds through to intersection and collide with their vehicle.

3. Designing Sidewalks and Trails for Access, Best Practices Guide, FHWA, 2001. Chapter 9, Traffic Calming. This publication acknowledges the universal benefits of traffic calming and cites specific examples of potential negative impacts.

4. The Manual on Uniform Traffic Control Devices (MUTCD) is approved by the Federal Highway Administrator as the National Standard in accordance with Title 23 U.S. Code, Sections 109(d), 114(a), 217, 315, and 402(a), 23 CFR 655, and 49 CFR 1.48(b)(8), 1.48(b)(33), and 1.48(c)(2). Available online at http://mutcd.fhwa.dot.gov

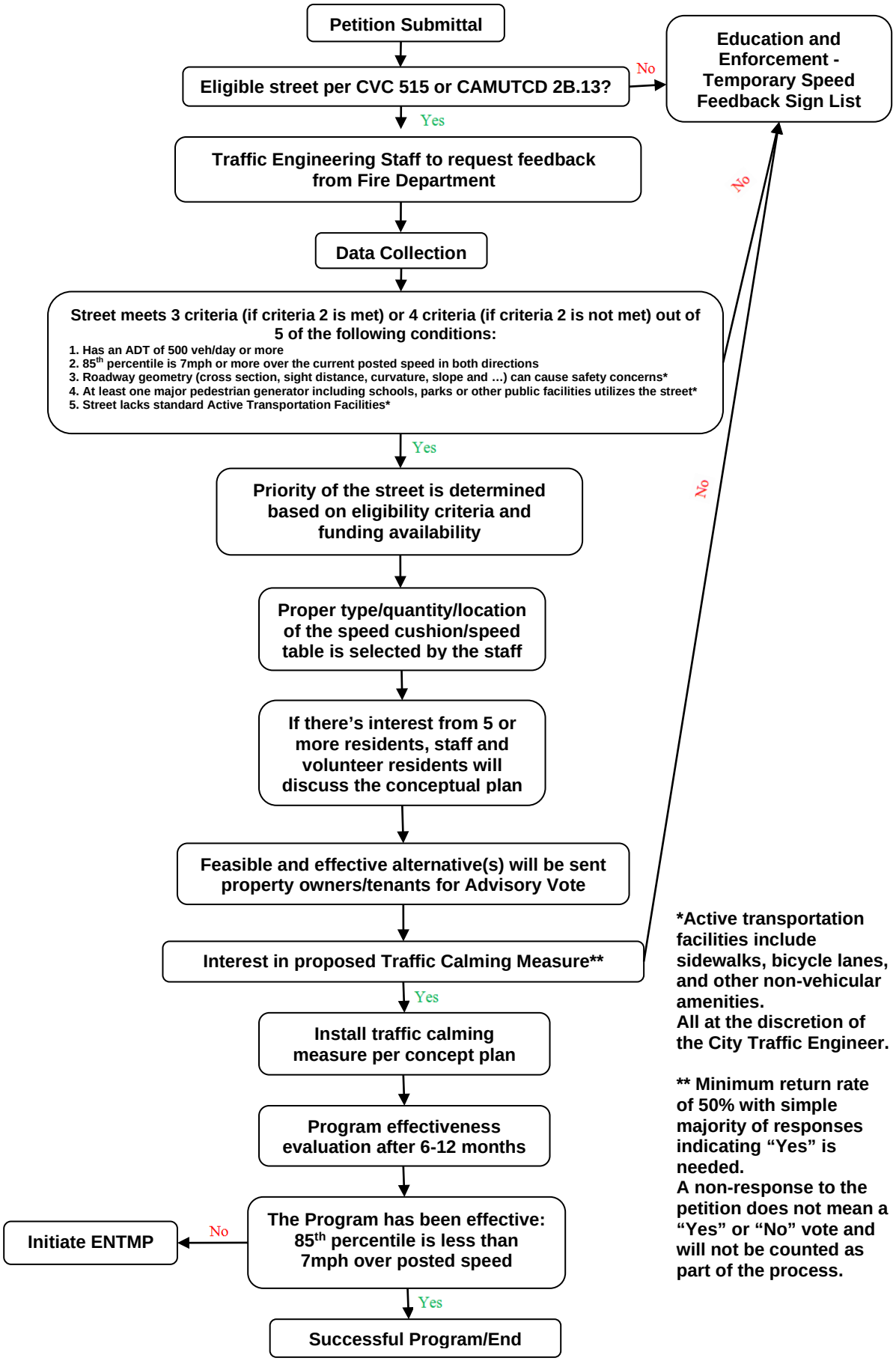
ADDITIONAL RESOURCES

Managing Speed: Review of Current Practice for Setting and Enforcing Speed Limits; Transportation Research Board, National Research Council Special Report 254, 1998.

A Policy on Geometric Design of Highways and Streets, 1994. American Association of State Highway and Transportation Officials.

Traffic Calming: State of the Practice; Institute of Transportation Engineers for the Federal Highway Administration, August 1999.

“Revised” First Tier Traffic Management Flowchart



***Active transportation facilities include sidewalks, bicycle lanes, and other non-vehicular amenities.**
All at the discretion of the City Traffic Engineer.

**** Minimum return rate of 50% with simple majority of responses indicating “Yes” is needed.**
A non-response to the petition does not mean a “Yes” or “No” vote and will not be counted as part of the process.

Revised and approved by City Council 11-15-2017